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ABSTRACT

This document is a partial bibliography for marine educators in a truly cross disciplinary sense. It is intended for those who teach art, music, social studies, mathematics, business subjects, home economics and wood shop as well as science. Many marine science curricula guides are included in this bibliography. An introduction which indicates the importance of the bibliography and how it is to be used is presented. The publication is divided into the key word index section and the citations section. The key words or descriptors are listed alphabetically. Each key word subsection lists sequentially by number each document having been identified by the key word. Citations including an annotation have an asterisk before their respective numbers in the key word section as well as the citation section. Entries in the citations sections are listed alphabetically by number. Each entry is followed by a word or words in parentheses. These parenthetically enclosed words indicate the key word or words under which the entry has been listed. (HM)

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Education and the World Ocean

A Partial Bibliography for Marine Educators

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1978

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To All of Our Children

For It Is They Who Must Preserve the Sea

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PREFACE TO A PARTIAL BIBLIOGRAPHY FOR PRECOLLEGE MARINE SCIENCE EDUCATORS

The marine environment is a vast and complicated place. Its sutdy embraces all of the sciences and its effects are often felt many hundreds of miles from their source. This environment includes some of the most prolific species known to man as well as some soon to become extinct unless conservation measures are quickly instituted. Some marine species have a vast potential as a human food source. The key to man's eventual survival may lie here.

Educators have long been aware of the World Ocean's potential. In recent years, probably because of the impetus provided by world food and ocean pollution problems, they have felt a need to provide marine science instruction at the precollege level. Forward looking educators have realized the need for a marine scientifically literate public. These futuristic pedagogues also were aware that educating people to the point of scientific literacy required many years, not just a crash course.

Increasingly, teachers at all levels are being asked, by both school administrators and the public, to offer marine science instruction. Most are not well prepared to accomplish this task. However, precollege teachers are a resourceful lot. They are highly skilled in putting to work materials and information generated by others. One problem they are continually plagued with, though, is insufficient time. While there may be vast amounts of information available, locating it is often prohibited by lack of time.

Prior to designing an appropriate marine science program, regardless of the grade level, one must have a good bibliography from which to draw. The bibliography normally forms the basic building block of any good science program. Obviously, a bibliographical work is of paramount importance to those with a limited background in the sciences and/or the marine sciences.

The aim of this publication is to help precollege teachers and others interested in the marine sciences. Many marine science curriculum guides

are included amongst these listings. This bibliography should in no way be interpreted as being complete. The citations were drawn from Education Index, Current Journals in Education, Masters Theses in Education, Reader's Guide to Periodical Literature, Resources in Education (ERIC) and the citations included in the various articles. Some of the citations may be used directly by precollege students while others require abstraction prior to use.

Any mistakes in spelling, titles, inclusive page numbers, year of publication, journal volume number, etc. are solely the responsibility of the author.

This publication was developed with the aid of funding from a mini-grant awarded by University of Maine Sea Grant. Public Law 89-688 of 1966 was the original source of project funding.

The author wishes to take this opportunity to express his appreciation to Brenda Mowdy who typed this manuscript and so graciously made many corrections.

Richard M. Schlenker

PREFACE TO EDUCATION AND THE WORLD OCEAN

The predecessor to this edition was titled, A Partial Bibliography For Precollege Marine Science Educators. It is now available through the Educational Resources Information Center and its ERIC number is ED 137 130. Its publication date was August 1977.

A Partial Bibliography For Precollege Marine Science Educators was originally a draft copy of what was to be this volume. When originally printed, it was meant to be distributed only to those educators who were in attendance at the December 10, 1976 State of Maine, Marine Education Conference. However, the constraints of time, other priorities and demand led to two printings prior to rewriting.

Education and the World Ocean has several features which are somewhat different from its predecessor. First, it is organized according to a key word format and those keywords are presented alphabetically. Second, the former edition was divided into two sections: one section was annotated while the other was not. In this edition, all entries belonging under a given descriptor or key word are included under that descriptor regardless of whether or not they have been annotated. Finally, Chapter I of the former publication has been expanded and included as the Forward in this writing.

While the title of the former edition suggested it to be oriented only toward the science teaching world that was not the intent. This edition, like the former, is intended for marine educators in a truly cross disciplinary sense. It is intended for those who teach art, music, social studies, mathematics, business subjects, home economics and wood shop as well as science. However, it is true that there are more entries tending toward science than the other disciplines. The reason for this is that until quite recently,

"Marine" has been a term in precollege education reserved almost totally for the science teachers. It is only of late that we as a society have started thinking of educating the marine literate society; a task whose proportions demand a cross disciplinary approach. Teaching our children marine awareness, as is said in sea going circles, is an all hands evolution.

The author wishes to express his appreciation to the countless individuals who encouraged this rewrite. A special note of thanks is in order for Dr. Harold Goodwin, former Associate of the National Sea Grant Program, Dr. Robert Stegner of the University of Delaware, Dr. John Butzow of the University of Maine, and Dr. Lester Picker, former Assistant Director of the Northern New England Marine Education Project at the University of Maine, Orono.

The key to projects of this magnitude is an outstanding typist. As before, that typist was Brenda Mowdy. Again, Brenda graciously and unceremoniously waded through the manuscript making many corrections and pointing out errors when they surfaced.

Richard M. Schlenker

FORWARD

Perhaps the most difficult task facing researchers is that of information acquisition. Skillful researchers visualize the whole, break it into its component parts and then synthesize a new whole. They use a thesaurus to obtain key words or descriptors, then use the key words in searching various abstracting services. When suitable references have been located, their literature cited sections are consulted for useful inclusions. A searching strategy of this type has a pyramiding effect and most often yields fruitful results. This was the scheme used in obtaining the information cited in this work.

Annotation often saves the reader many hours of work. The remainder of this publication is partially annotated; that is, many of the entries are annotated. Whenever possible, the annotations were written with the intention of making them as comprehensive as possible.

The remainder of the text is arranged alphabetically by key words. However, the reader should approach this scheme with some degree of caution. The inclusion of a citation under a certain heading is somewhat arbitrary, especially since in some cases several different types of information are presented within an article. For example, one might encounter a curriculum guide which deals with both marine science and marine science career education material. In cases such as these, an attempt has been made to list the citation under the key word best describing the citation's major emphasis.

Wherever possible, a grade level or range of grade levels of applicability have been included with the citations. These are suggested grade levels or ranges which, in most cases, were assigned by the author. Imaginative teachers, however, should be able to adapt most of the entries in this text to any grade level of their choosing.

Some of the citations, especially those from Science, use sophisticated scientific vocabularies. These articles will generally require abstraction by the teacher prior to use. Articles of this description might be used to challenge some of the ablest students.

Citations listed in Resources in Education (ERIC) have a unique ED number. Libraries subscribing to ERIC normally hold indexes, descriptor usage reports, thesaurus, and microfiche copies of the majority of references cited. Hard copies of these references may be procured from:

ERIC Document Reproduction Service
P. O. Box 190
Arlington, Virginia 22210

The price of hard copies varies depending upon the number of pages and pricing information will be supplied upon request. The requester need supply only the ED number and whether the interest is in a hard copy or a microfiche copy. Since the prices of microfiche copies are normally minimal, individuals whose libraries do not subscribe to the ERIC system can normally afford to purchase essential documents. The user, however, must bare in mind that microfiche copies require a microfiche reader of some type in order to be read.

A few documents listed by ERIC are not available from ERIC. Wherever the source is other than ERIC, that information is included with the citation. In a few instances, these documents are available from the National Technical Information Center in both hard copy and microfiche. Pricing information is available from:

National Technical Information Center
Operations Division
5285 Port Royal Road
Springfield, Virginia 22151

The text also includes a third type of ERIC document. These documents include an SE number as part of their citation. They are available in hard copy

from:

ERIC Information Analysis Center for Science, Mathematics,
and Environmental Education
The Ohio State University
1200 Chambers Road
Columbus, Ohio

The periodical inclusions are normally available in college, university and public libraries. They may also be found in many good high school libraries. Necessary periodical articles, when not available locally, may be obtained via interlibrary loan. This service is available through most libraries and when there is a charge for the service, it is nominal.

Unpublished masters theses may normally be obtained through interlibrary loan. These documents are usually available on a no cost basis for a minimum time period.

HOW TO USE THE BIBLIOGRAPHY AND KEY WORD INDEX

Key words have been identified for general groupings of topics and subsequently listed alphabetically in the key word section of the bibliography. Each key word subsection lists sequentially by number each document having been identified by that key word. Citations including an annotation have an asterisk (*) before their respective numbers in the key word section as well as the citation section.

In the key word section the various citations have been listed under the key word which this author thought most appropriate. However, while it is possible that some entries might easily have been listed under more than one key word, the entries have not been cross-referenced except in the case of the key words-- "Elementary School" and "High School"

Users should scan the key words identifying their areas of interest. In this manner it is possible to identify not only citations by number but also those that are annotated. Further, it also is possible before looking at a specific citation to determine in many cases whether the citation fits the users particular academic level. This may be accomplished by scanning the elementary and high school key words in addition to that of an academic area. If a number appears under both the academic and grade level key words, that entry will probably be of interest to the user.

Entries in the citations sections are listed alphabetically by number. Each entry is followed by a word or words in parentheses. These parenthetically enclosed words indicate the key word or words (some documents are listed under a grade level descriptor as well as one of the academic descriptors) under which the entry has been listed.

Some entries in the citations section indicate a grade level or a grade level range. The reader should, however, be aware that assigning grade levels was somewhat subjective. It seems reasonable to say that any of these entries can be used at any educational level if they are abstracted by the user.

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Those entries marked with an asterisk (*) have been annotated in the citations section.

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CITATIONS

The word in parentheses immediately following each entry indicates the key word under which the citation has been listed. The grade listed in parentheses after some articles indicates a general level of applicability. The asterisk preceding some citations indicates that an annotation immediately follows an entry so marked.

*1. Able, R. P. Education in marine science and technology--historical and current issues. 1967 (ERIC Document Reproduction Service No. ED 056 859). (Conferences)

This is a report on information presented at the American Association for the Advancement of Science Conference. Three of the areas discussed were manpower, history, and education.

2. Able, R. B., & Lindquist, C. B. Inner space: sea of opportunity. American Education, 1965, 1 (3), 1-7. (Careers)

3. Adams, J. E. Primative whaling in the West Indies Sea. Frontiers, 1975, 21, 303-313. (Whales)

*4. Adams, V. A. Education for survival. School Management, 1970, 14 (12), 10-13. (Curricula)

The author discusses present and proposed ecologically oriented school programs. She points out that ecology as a subject, still receives little attention in our schools.

*5. Alaska State Department of Education. Aquaculture: a course of study for Sand Point Secondary School. 1978 (ERIC Document Reproduction Service No. ED 144 788). (Curricula) (Grades 7-12)

The program was designed to involve students in the economic aspects of their community. It introduces the student to the aquaculture of marketable species and the ecological conditions requisite to maintaining a viable fishery. It includes units on water quality, general biology, fisheries techniques, biological and physical oceanography, and aquaculture technology.

6. Agnello, R. J., & Donnelley, L. P. Externalities and property rights in the fisheries. Land Economics, 1956, 52 (4). (Law)

7. Allen, A. A., et al. Natural oil seepage at Coal Oil Point, Santa Barbara, California. Science, 1970, 170 (3961), 974-977. (Pollution)

*8. Allen, N. B. Uncle Sam's fur farm. Grade Teacher, 1936, 53 (5), 46-47. (Seals) (Grades 4-12)

This article is of historical value. It describes seal life, products made from seals, and the seal industry at the time.

9. Alpeter, K. In defense of a harem: elephant seals. International Wildlife, 1974, 4, 24-25. (Seals)

*10. American Biology Teacher. Teeth and barnacles. American Biology Teacher. 1969, 31 (4), 260. (Barnacles) (High School)

In this article, the author describes how the adhesive made by barnacles is used by dentists in filling teeth.

*11. American Biology Teacher. The seahorse. American Biology Teacher, 1969, 31 (4), 243. (Periodicals)

This brief article describes a periodical titled, The Seahorse, which is available from Hydro Products, P.O.Box 2528, San Diego, California 92112.

*12. American Biology Teacher. Salt marshes. American Biology Teacher, 1968, 30, 197. (Salt Marsh)

A live salt marsh was set up on a university campus. The salt marsh was used to study the effects of DDT upon saline organisms.

*13. American Biology Teacher. Aquaria. American Biology Teacher, 1967, 29 (7), 540. (Aquaria)

The author discusses the use of marine aquaria at an inland school.

*14. American Biology Teacher. California sea otter census. American Biology Teacher, 1966, 28 (7), 535. (Sea Otter) (Grades 7-12)

The otter's life cycle is discussed, along with the laws concerning the beast. The author points out that the otter is a protected species.

*15. American Biology Teacher. Menhaden. American Biology Teacher, 1966, 28 (1), 38. (Fish) (Grades 7-12)

The economic value of this species seems great. Some of the products made from the species are oils, drying agents, paints, varnish, and animal feeds.

*16. American Biology Teacher. Teredos. American Biology Teacher, 1966, 28 (1), 38. (Mollusca) (Grades 7-12)

Teredo navalis causes great economic damage to wooden boat hulls and wooden water front structures. The author discusses an American zoologist who, at the time, was investigating a marine flatworm which ate teredo sp. eggs.

*17. American Biology Teacher. Marine sounds. American Biology Teacher, 1966, 28 (1), 38. (Communication) (Grades K-12)

The article discusses marine animal sounds which were recorded by a junior high school student.

*18. American Biology Teacher. Marine environment symposium. American Biology Teacher, 1965, 27 (2), 117. (Conferences)

A marine environmental symposium was held at Fullerton, California. This article describes the conduct of the symposium.

*19. American Biology Teacher. Marine microorganisms. American Biology Teacher, 1965, 27 (2), 117. (Microorganisms) (High School)

The author describes a conference whose subject was marine microorganisms.

*20. American Biology Teacher. Fresh seafood. American Biology Teacher, 1965, 27 (1), 29. (Fish) (High School)

This article discusses a method of prolonging the life of fresh fish at temperatures above freezing.

*21. American Biology Teacher. Rhode Island plans oceanarium. American Biology Teacher, 1960, 22 (9), 543. (Facilities)

The author discusses an Oceanarium which was built at Saunderstown, Rhode Island in 1961.

*22. American Society of Oceanography. The oceans and you. 1971 (ERIC Document Reproduction Service No. ED 064 088). (Careers)

This article describes an Oceanographic Information Kit which contains booklets describing oceanography, ocean industries agencies, bibliographies (reading leveled), colleges having oceanography programs, and oceanographic information sources.

23. Andersen, R. Life on the tidal mudflats: Elkhorn Slough. 1972 (ERIC Document Reproduction Service No. ED 073 946). (Mudflats) (Grades 6-12)

*24. Anderson, B. R. With cooperation and care, students get back to nature. College and University Business, 1972, 53 (2), 39-41. (Facilities)

A New Jersey consortium enables land-locked colleges to give their ecology and oceanography students the ocean to use as a laboratory.

25. Anderson, L. G. U. S. fisheries: a new opportunity for conservation and management. Marine Policy Reports, 1977, 1 (2). (Fish)

*26. Anderson, R. G. An investigation of tides: are they related to the moon? Science Teacher, 1968, 34 (5), 21-23. (Tides)

This is a discussion of tides, tide generating forces, publications useful to teachers in the study of tides, and methods which can be used in the classroom to study tides for an entire year.

27. Andolina, M. A miniature ecosystem. Conservationist, 1971, 25 (6), 47-48. (Ecology)

28. Anon. Fisheries in the classroom. Sea Frontiers, 1962, 8 (2), 32-38. (Curricula)

*29. Anson, E. M. Putting the tide zones and marine biology together. Instructor, 1973, 82 (9), 85-86. (Curricula)

The students at Serria College, Rocklin, California have set up a program for 5th graders. The program involves slides showing animals found in the intertidal zone. After their study, the 5th graders take a weekend trip to the coast where they study all levels of the intertidal zone. As a result of their study, the 5th graders are able to do such things as define marine biology, identify the 4 tidal zones, etc.

*30. Anthony, V. Use of population dynamics in marine fisheries studies. American Biology Teacher, 1967, 29 (6), 448-452. (Fish) (High School)

The author discusses a method by which fish populations may be studied.

*31. Area Cooperative Education Services. Coastal wetlands. 1977 (ERIC Document Reproduction No. ED 133 220). (Curricula) (High School)

This document includes student guide sheets, reference materials, and a tapescript for an audio-tutorial unit on coastal wetlands. The materials were designed for use in the Connecticut schools. The activities include information about wetlands food chains, cycles, and organisms.

32. Arehart-Treichel, J. Combating the red tide. Science News, 1975, 108, 74-75. (Microorganisms)

*33. Assel, R. A. St. Lawrence River freeze-up forcast procedure. 1977 (ERIC Document Reproduction Service No. ED 134 396). (Oceanography)

The author presents a method by which the date of river freeze-up may be calculated.

34. Astro, R. Where humanities meet the sea. Sea World, Fall 1977, 18-20. (Curricula)

*35. Attell, A. Trouble under the sea. The Grade Teacher, 1957, 74 (9), 25. (Macroorganisms).

The article presents some basic information about salmon, shrimp, and sea horses. The article is written in story form.

36. Audubon. Sea turtles. Audubon, 1976, 78, 133. (Sea Turtles)

37. Audubon. Life in a cold ocean; with photographs. Audubon, 1974, 76, 18-49. (Ocean Depths)

38. Aviation Week & Space Technology. NOAA--3 observes sea temperature flux. Aviation Week & Space Technology, 1974, 101, 54. (Temperature)

*39. Awkerman, G. L. Zones of life in the sea. 1974 (ERIC Document Service No. ED 086 557). (Curricula)

This program was developed with a grant from Title III of the ESEA. It was designed for use in a standard curriculum and includes teachers guides and student activities. Some of the student objectives of this program are to describe changes in environmental factors related to change in depth, to identify a number of oceanic zones, to identify zones of a beach, to describe the beach zones relative to diversity of organisms present, etc.

*40. Awkerman, G. L. Marine biological field techniques. 1974 (ERIC Document Reproduction Service No. ED 086 555). (Curricula) (High School)

This publication was developed with a grant from Title III of the ESEA. As with ED 086 557 above, this document was designed for use with a standard science curriculum, and is a useful tool for high school field trips. Student objectives of this unit are to learn how to use various nets for capturing marine life, to identify common organisms at Folly Beach, North Carolina, to identify major beach zones, and to define salinity and describe its major effects on organisms.

*41. Awkerman, G. L. Estuaries. 1974 (ERIC Document Reproduction Service No. ED 086 554). (Curricula)

The three units in this guide were developed with funding from Title III of the ESEA. The program includes teachers guides, student activities, and demonstration information. The student objectives are to define an estuary, to describe environmental fluctuations of an estuary, to describe 5 types of estuaries, to list the biological characteristics of an estuary, and to describe the most important function of a crab's shell.

*42. Awkerman, G. L. Aspects of marine ecology. 1974 (ERIC Document Reproduction Service No. ED 086 553). (Curricula) (High School)

Aspects of Marine Ecology is another document developed with funding from Title III of the ESEA, and was designed for use with a standard science curriculum. It includes teachers guides, student activities, and demonstrations, and was specifically intended to impart understanding of the aspects of marine ecology to high school students. The student program objectives are to identify fundamental sources of energy for marine ecosystems, to describe functions of producers, consumers and decomposers, to identify typical food webs and chains, to explain relationships between local nutrient depletion and stratification of ocean circulation, and to discuss the effects of pollution on the marine ecosystem.

*43. Awkerman, G. L. Animals of the sea: coelenterates, protozoa, and sponges. 1974 (ERIC Document Reproduction Service No. ED 086 552). (Curricula) (High School)

This is another curriculum package designed to be used with the standard science curriculum, and developed with funding from ESEA. It consists of three units and includes teachers' guides, student activities, and demonstrations. The student objectives for the unit on sponges are to list classes of sponges, to describe the life habits and functions of sponges, and to describe sponge reproduction. The objectives of the unit on protozoans are to identify radiolarians, foraminiferians, and tentinnids, to describe the life processes of these organisms, and to identify oceanic sediments produced by radiolarians, and foraminiferians. The objectives of the unit on coelentrates are to list the classes of coelentrates, describe the locomotion and feeding habits of coetenterates, and to describe the relationship between reproductive stages representing the alternation of generation phenomenon.

*44. Awkerman, G. L. Sea changes, topics in marine earth sciences. 1974 (ERIC Document Reproduction Service No. ED 086 556). (Curricula) (High School)

This curriculum package was developed with the aid of the ESEA to be used in the standard high school science curriculum. The package includes the following topics: continental drift, shoreline changes, sea level changes, beaches, nearshore currents and man made structures and estuaries.

*45. Awkerman, G. L. , Teller, P. F., & Laurie, D. Priorities in ocean science. Science Education, 1974, 58 (4), 449-456. (Curricula)

The authors report the results of a national survey conducted to determine the priorities in ocean science study as identified by the community of oceanographers. The seven most important areas identified (in descending order) were: where do we find life in the sea; why is the continental shelf so productive; what kinds of animals do we find in the sea; how much food can we get from the sea; how does the sea affect the world's weather; how is the ocean important to man; how does the sun affect the sea.

46. Baarslag, K. Island besieged: the outerbanks of North Carolina. Oceans, 1975, 8, 34-37. (Beaches)

47. Bach, S. D., & Beardsley, G. L. Disease of the Florida spiny lobster. Sea Frontiers, 1976, 22, 52-53. (Lobster)

48. Baiardi, J. C. Some progress and plans for water and water resources. Communicator, 1971, 3 (2), 23-26. (Pollution)

49. Ballard, R. D. et al. Manned submersible observations in the FAMOUS area: mid-atlantic ridge. Science, 1975, 190, 103-108. (Geology)

*50. Baird, G. Oceanography in a swimming pool. Science and Children, 1974, 11 (7), 7-10. (Methods) (Grades K-12)

In this program, students at Elmhurst School in Ventura, California use a neighborhood swimming pool to conduct oceanographic observations. They use the pool as a wave tank and a board to create the waves, draw contour maps of the bottom of the pool, measure the depth of the pool with weighted strings, measure current direction, measure turbidity with a homemade Secci disc, take water samples, and then summarize activities after they return to school. The students spend about 75 minutes at pool side.

51. Bailey, H. S. The voyage of the challenger. Scientific American, Offprint No. 830, May 1953. (History) (High School)

52. Bakus, G. J., & Green, G. Toxicity in sponges and holothurians: a geographic pattern. Science, 1974, 185, 931-934. (Macroorganisms)

*53. Ballard, K. A study of the sea. Instructor, 1961, 70 (8), 46. (Methods) (Grade 1)

In this article the author discusses a method of teaching first graders about the sea.

54. Banerjee, T. Training marine science technicians for the hydrospace age. Technical Education News, 1970, 29 (1), 10-12. (Careers)

*55. Banerjee, T. Syllabus for an associate degree program in applied marine biology and oceanography. 1970 (ERIC Document Reproduction Service No. ED 046 750). (Careers)

The author describes a two year AAS degree program at Southern Maine Vocational Technical Institute, Portland, Maine which trains marine science technicians. The document includes pictures of activities, sample tests, and experiments.

*56. Bang, F. B. Immune reactions among marine and other invertebrates. BioScience, 1973, 23 (10), 854-859. (Macroorganisms)

The author discusses defense mechanisms and immu e reactions found in invertebrates. The author further discusses the wealth of biological problems related to these organisms that need study.

*57. Barnes, W. J. P. et al. Corophium volutator--an intertidal crustacean useful for teaching in schools and universities. Journal of Bio-Education, 1969, 3, 283-298. (Methods)

The author describes collection and maintenance of Corophium volutator. Further described are observations on the beast's behavior, experiments related to substrate selection, reactions to light, movement out of the water, and population analysis.

58. Barrie, N. When push comes to shove. International Wildlife, 1975, 5, 18-19. (Gulls)

*59. Barton, T. F. Is there an antarctic ocean. Journal of Geography, 1954, 53, 14-17. (Geography) (High School)

This article discusses the reasons why there is no Antarctic Ocean.

60. Bascom, W. Science and ancient sea stories. Sea World, Fall 1977, 25-26. (History)

61. Bascom, W. Beaches. Scientific American, Offprint No1 845, August 1960. (Beaches) (High School)

62. Bassis, M. S., & Rosengren, W. R. Socialization for occupational disengagement: vocational education in the merchant marine. Sociology of Work and Occupations, 1975, 2 (2), 133-149. (Careers)

63. Bates, C. C. Oceanography, ocean transportation and related manpower needs in educating and training tomorrow's oceanographers. Conference of the American Management Association, 1969. (Careers)

*64. Bates, H. O. Father crab goes househunting. Grade Teacher, 1955, 72 (10), 49. (Crabs) (Grades K-8)

Hermit crabs, as they grow larger, search for new shells in which to dwell. The author describes this search as well as the methods by which the beast swims.

65. Bates, M. The forest and the sea: a look at the ecology of nature and the ecology of man. New York: Vintage Books, 1960. (Text)

*66. Beakley, J. C. et al. Sourcebook of marine sciences. 1970 (ERIC Document Reproduction Service No. ED 046 715). (Curricula) (High School)

This publication was developed with funds from Title III of the ESEA by the Division of Elementary and Secondary Education, Florida State Department of Education, Tallahassee, Florida. It is a collection of 42 marine science activities. These activities include all aspects of the marine environment. The document could serve as a laboratory manual.

*67. Beakley, J. C. The sourcebook of marine sciences. 1970 (ERIC Document Reproduction Service No. ED 054 118). (Curricula)

The 39 chapters of this publication include the following major topics: salt water aquaria, the nature of tides, the use of the microscope, beach analysis, salinity of the sea, a study of a variety of creatures, and an analysis of marine populations. The document also includes lesson objectives and instructional materials.

68. Beam, K. B. An evaluation of two summer conferences on marine environments. Unpublished masters thesis, North Carolina State University, 1972. (Curricula)

*69. Beckhart, L. H. Queer hitch-hikers. American Childhood, 1948, 33 (5), 58. (Fish) (Grades K-8)

The author discusses a small fish which spends its entire life either inside or riding on the outside of a whale.

*70. Beckhart, L. H. Some fish sing. American Childhood, 1946, 31 (5), 56. (Fish) (Grades K-6)

This article is a discussion of the noises which some fishes make and the methods by which they accomplish the task.

71. Behrman, D. World's biggest fishery of Peru threatened. Unesco Currier, 1974, 27, 34-35. (Fish)

72. Bell, A. World's remaining whale populations will continue to decline. National Parks & Conservation Magazine, 1975, 49, 28-29. (Whales)

*73. Bennett, L. M. Marine aquaria--their value in teaching science in the elementary school. School Science and Mathematics, 1972, 72 (1), 57-71. (Aquaria) (Grades K-8)

This is a discussion of the sources of aquarium materials, specimens, salt to mix salt water, and the obtaining and using of live specimens.

*74. Bennett, L. M. Marine biology project of Texas Women's University. School Science and Mathematics, 1967, 67 (595), 723-738. (Curricula) (Grades 4-6)

This article describes a program which was developed for grades 4-6.

*75. Bennett, L. M. A marine ecology unit for seventh grade. American Biology Teacher, 1966, 28 (1), 43-50. (Curricula) (Grade 7)

This is an overview of a unit developed for use with grade 7 students. The author concludes as a result of statistical analysis that grade 7 students can handle marine science material.

*76. Bennett, L. M. Marine life: for fifth grade. Science Education, 1964, 48 (5), 404-418. (Curricula) (Grade 5)

Marine Life: For Fifth Grade is a nine day unit. It includes scientific information for teachers, as well as activities and tests.

*77. Bennett, L. M. Determining the feasibility of presenting a marine biology unit in ecology to average graders. School Science and Mathematics, 1964, 64 (563), 306-311. (Curricula) (Grade 7)

A study was conducted to be ascertained whether or not such an offering was reasonable. Such an offering turned out to be reasonable. (See Bennett, L.M. A marine ecology unit for seventh grade, above.)

*78. Bennett, P. Spirals in nature. American Biology Teacher, 1966, 28 (7), 533-535. (Macroorganisms) (High School)

The article deals with spiral shell construction.

*79. Benson, R. C. The marine technician--past, present and future. 1973 (ERIC Document Reproduction Service No. ED 092 739). (Careers)

The author deals with the origin of the marine technician. He also discusses community needs in the marine technical areas. He further discusses factors required for a marine science technician training program, including the need for hands on experience.

80. Benyaakov, S. Carbonate compensation depth: relation to carbonate solubility in ocean waters. Science, 1974, 184, 982-984. (Chemistry)

81. Berger, W. H., & Johnson, T. C. Deep-sea carbonates: dissolution and mass wasting on Ontong-Java Plateau. Science, 1976, 192, 785-787. (Chemistry)

*82. Bernhardt, V. Father sea horse. American Childhood, 1945, 31 (4), 56-57. (Sea Horses) (Grades K-8)

The life cycle of the sea horse is discussed here. The article includes feeding and reproductive information. In the reproductive process, the eggs are harbored in the pocket of the father.

83. Bertsch, H. Snale that eats sea stars. Sea Frontiers, 1975, 21, 281-282.

84. Bevelander, G., & Nakahara, H. The development of the embryo of the sand dollar Echinarach inius parma. Turtox News, 1962, 40, 131-132. (Methods)

85. Beyers, R. J. The metabolism of twelve aquatic laboratory microecosystems. Ecological Monographs, 1963, 33, 281-306. (Methods) (High School)

86. Bioscience, Human stomach ulcerations traced to fish parasites; anisakis. Bioscience, 1976, 26, 300. (Food)

87. Bioscience, Warning, exotic crabs may be hazardous to your health. Bioscience, 1976, 26, 223. (Crabs)

88. Bioscience, Red tide research flows on. Bioscience, 1976, 216, 223. (Microorganisms)

89. Bioscience, Algae may extract sea-borne uranium. Bioscience, 1975, 25, 595. (Microorganisms)

90. Bioscience, Study proposed for El Nino Current. Bioscience, 1974, 24, 296. (Currents)

*91. Bishop, B. F. The spotted sandpiper. American Childhood, 1948, 33 (5), 57-58. (Birds) (Grades K-8)

The author discusses the sandpiper's nest building scheme, the number of eggs it lays, and other characteristics about its life's habits.

*92. Boer, H. B. Utilization of a marine environment in the teaching of biology. American Biology Teacher, 1955, 17 (5), 171-173. (Methods) (High School)

This is a discussion of the needs and possibilities for teaching an entire biology course within the confines of marine science. The author also makes suggestions concerning the ways in which other subjects can be related to the sea.

93. Boeri, D., & Gibeon, J. Tell it goodby, kiddo--the decline of New England offshore fishery. Camden, Maine: International Marine Publishing Company, 1976. (Text)

94. Boffey, P. M. Sea-level canal: how the academy's voice was muted. Science, 1971, 171 (3969), 355-356. (History)

*95. Bolles, W. H. Earth and space science: a guide for secondary teachers. 1973 (ERIC Document Reproduction Service No. ED 094 956). (Curricula) (High School)

Earth and Space Science is a collection of five units, one of which is titled, The Oceans. The publication also includes the basic scientific information necessary for teachers to teach the units.

96. Bolster, W., & Keller, M. Wind upon water. Oceans, 1975, 8, 40-49. (Waves)

97. Bonnell, M. L., & Selander, R. K. Elephant seals: genetic variation and near extinction. Science, 1974, 184, 908-909. (Seals)

*98. Boolootan, R. A., & Thomas, J. The realm of the marine biologist. American Biology Teacher, 1966, 28 (1), 13-18. (Careers) (High School)

The authors define the marine environment and then describe what a marine scientist does.

99. Booth, R. F. Demographic characteristics, psychosocial perceptions, and performance of strikers accepted for navy paramedical training. 1976 (ERIC Document Reproduction Service No. ED 122 143). (Careers)

100. Borden, C. D. The development of a model for building marine science learning activities for individualized instruction of elementary pupils in connection with a marine science laboratory curriculum. Unpublished masters thesis, Seattle Pacific College, 1970. (Curricula)

101. Borgese, E. M. Farming the seas; excerpt from the drama of the oceans. Oceans, 1976, 9, 58-65. (Aquaculture)

*102. Bovbjerg, R. V., & Glynn, P. W. A class exercise on a marine microcosm. Ecology, 1960, 41, 229-232. (Curricula)

A class measures marine community structure, community dynamics (such as standing crop), and other parameters related to a marine microcosm.

103. Bowman, G. Phytoplankton of the San Joaquin River. Unpublished masters thesis, Humboldt State College, 1967. (Methods)

*104. Boyar, H. C. Swimming behavior of fishes. American Biology Teacher, 1967, 29 (6), 442-444. (Fish) (High School)

The author discusses fish swimming and includes a consideration of length vs. speed.

105. Boycott, B. B. Learning in the octopus. Scientific American, Offprint No. 1006, March 1965. (Mollusca) (High School)

*106. Boyd, E. Dive-in for dropouts. Oceans, 1973, 6 (5), 54-55. (Curricula)

Florida Marine Science Institute at Deerfield Beach, Florida conducts a program for youth aged 14-18 years with normal IQ's and reading levels of at least grade six. Most of the youth who are involved in this program are dropouts from the traditional educational system. During their tenure (9 months) at the Institute, they study in the following areas: rigging, charting, navigation, ships carpentry, drafting & blueprint reading, hydrographic surveying, plotting currents, waves, and tides, ecological pollution, marine biological collection.

*107. Boyer, R. E., & Butts, D. P. Capturing excitement: oceanography. Science and Children, 1971, 8 (6), 14-17. (Methods) (Grades K-8)

This article describes four activities. Each activity is designed to help children answer questions about the ocean floor, continental drift, volcanism, and mountain chains.

108. Boyle, E. Biological uptake of dissolved silica in the Amazon River Estuary. Science, 1975, 198, 995-997. (Microorganisms) (High School)

109. Boy Scouts of America. Oceanography. New Brunswick, New Jersey: Boy Scouts of America, 1965. (Text)

110. Boy Scouts of America. Sea Exploring Manual. New Brunswick, New Jersey: Boy Scouts of America, 1976. (Text)

*111. Brainard, R. W. Science policy bulletin number 4. 1968 (ERIC Document Reproduction Service No. ED 020 145). (Bibliography)

This is a bimonthly publication of the Battelle Memorial Institute, Columbus, Ohio. It includes bibliographical and other types of information related to science and public policy, including information related to the marine environment.

*112. Branley, F. M. Part III: The earth-moon system. Science and Children, 1971, 9 (4), 24-28. (Tides) (Grades K-12)

The author discusses tides, moon months and other tide related phenomena in terms which are easy to understand.

113. Branson, B. A. Sockeye salmon. Oceans, 1976, 9, 24-29. (Fish)

*114. Bratton, S. T. The tides: teaching the essential facts. The Journal of Geography. 1931, 30 (7), 291-293. (Tides) (Grades 7-12)

This is an excellent discussion of tide generating forces.

115. Bray, P. Washington and the sea, marine education for educators. Sea World, Fall 1977, 21-23. (Methods)

*116. Breckelman, J. The aquarium as a teaching device. American Biology Teacher, 1941, 3 (4), 133-135. (Aquaria)

The author discusses the building of an aquarium. Further, he discusses the stocking of aquaria, maintaining of organisms, animal feeding habits, and animal respiration.

*117. Brenat, F. R. The legend of siba. Sea World, Winter 1977-78, 20-22. (History)

The author discusses people who live by the sea in the islands of the Bismarck Archipelago of the South Pacific.

*118. Brevard County School Board. Man's impact on the environment: the barrier beach as an ecosystem. Update. 1976 (ERIC Document Reproduction Service No. ED 119 962). (Curricula)

This program was funded by Title III of ESEA and is a revised version of that listed in ED 106 076 below.

*119. Brevard County School Board. Man's impact on the environment: the barrier beach as an ecosystem. 1975 (ERIC Document Reproduction Service No. ED 106 076). (Curricula)

The program was developed with funds from Title III of ESEA, and deals with man's impact on the barrier beach. It was developed around the following questions: (1) What is the definition of the ecosystem? (2) What are some of the biotic and abiotic features of the ecosystem and how do they interrelate? (3) What biotic and abiotic features in the ecosystem have changed and or are undergoing change? (4) What are the natural factors causing change and how have they been brought about? (5) What man made factors are causing change? (6) What are the results of the changes? (7) What, if any, new changes are needed in the ecosystem? (8) How might these needed changes be brought about? The document further includes a section on learning activities, and a section related to implementation of the program.

*120. Brevard County School Board. Man's impact on the environment: the estuary as an ecosystem. 1975 (ERIC Document Reproduction Service No. ED 106 077). (Curricula)

The program was developed with support from Title III funds of the ESEA. Its design is essentially the same as that discussed for ED 106 076 above. Finally, it was developed around the same set of questions as was ED 106 076.

*121. Bright, D. B. The wild goose chase. Oceans, 1973, 6 (5), 53-56. (Careers)

This article discusses a five day oceanographic station which was made off the coast of Southern California. It was designed to give practical field experience to students enrolled in marine science courses and further, to give them an idea of what an oceanographer does at sea.

*122. Bridgeman, R. H. Tides and times. The Science Teacher, 1952, 19, 195-196. (Methods)

Tides and Times presents a method of teaching information about tides to students who do not live on or near the ocean.

123. Bronk, D. W. Marine biological laboratory: origins and patrons. Science, 1975, 189, 613-617. (History)

124. Brown, C. Characterization of some selected bacteria isolated from bivalve larva cultures and their effects upon crassostrea virginica. Unpublished masters thesis, Southern Connecticut State College, 1971. (Methods) (High School)

125. Brown, E. Help from kelp; seaweed as a food. Farm Health, 1976, 8, 59. (Food)

126. Brown, E. & Brown, V. Exploring Pacific Coast tide pools. Healdsburg, California: Naturegraph Company, 1966. (Text)

*127. Brown, H. J. Marine algae commerce. School Science and Mathematics, 1935, 35, 803-809. (Food)

The author explores the many commercial uses of algae, some of which are food related. For example, marine algaes are used in the production of fertilizers, iodine, potash, food agar, and algin.

128. Brown, J. E. Ocean energy. Science Digest, 1976, 79, 50-55. (Energy)

*129. Brown, M. D. The future of the oceanographic technician. American Biology Teacher, 1971, 33 (9), 528-531. (Careers) (High School)

Brown discusses programs which train the marine science technician (they are listed). He also discusses the future of the marine science technician vocation.

130. Brown, R. A., & Huffman, H. L. Hydrocarbons in open ocean waters. Science, 1976, 191, 847-849. (Pollution)

131. Brown, T. P. A study of the movement and homing behavior of limpets. Unpublished masters thesis, Western Washington State College, 1970. (Methods)

*132. Brown, W. H. Aquatic biology field trips. American Biology Teacher, 1958, 20 (3), 91-94. (Curricula)

The author discusses locations where water field trips can be taken. He also discusses a trip which was taken to the Caribbean area.

*133. Bruce, D. S., & Linden, D. C. Use of the marine vertebrate, the flounder, in the physiology teaching laboratory. American Biology Teacher, 1973, 35 (8), 465-469. (Methods)

The authors describe methods of using the flounder to study circulation and respiration. The beast is easily obtained from local fishermen.

134. Bruce, R. The scotia closing plankton net. Proc. Roy Phys. Soc., 1904, 15, 141. (Equipment)

*135. Bryan, A. H. Prehistoric sea monsters and the modern lamprey eel. Science Education, 1966, 50 (1), 81-82. (History)

This is a discussion of the eel in a geologically historical context.

*136. Bryan, A. H. Recent studies in marine bacteriology. Science Education, 1966, 50 (1), 76-81. (Methods)

The article provides information concerning laboratory techniques.

*137. Bryan, A. H. The red tide. American Biology Teacher, 1963, 25 (1), 53-54. (Microorganisms)

It is pointed out that red tides are caused by dinoflagellates. The author also discusses the water conditions which are necessary before a red tide can occur.

*138. Bryan, A. H. Conservation of the edible crabs of our coastal and inland salt waterways. American Biology Teacher, 1963, 25 (1), 36-39. (Macroorganisms)

This is a discussion concerning the need for conservation of our crab population. It is pointed out that most people do not know the difference between edible and inedible species.

*139. Bryan, A. H. The halophiles: recent studies in marine bacteriology. American Biology Teacher, 1962, 24 (7), 499-503. (Methods) (High School)

Collection of methods, observations, methods of data analysis, and conclusions are discussed here. The collection uses slide boxes and slides, and is simple and inexpensive.

*140. Bryan, A. H. Aristotle's lantern. American Biology Teacher, 1955, 17 (7), 230-231. (Sea Urchins)

This is a discussion of the structure of Aristotle's lantern.

141. Bryan, R. C. Campus ecology. Science Activities, 1974, 11 (3), 29-31. (Methods)

142. Bryan, W. B. Floor of the mid-atlantic rift. Scientific American, 1975, 233, 79-90. (Geology)

143. Buchanan-Wollaston, N. J. On a new form of plankton net, designed to make truly vertical hauls in any weather. Cons. Perm. Inter. Expl. de la Mer, Publ., 1911, 58-59, 9-13. (Equipment)

*144. Buck, D. R. Marine technology: diversity and flexibility. New Directions for Community Colleges, 1973, 1 (4), 53-58. (Careers)

The marine technologist must be trained with diversity in mind so that he or she will be flexible enough to accomodate the changing job market.

*145. Bureau of Naval Personnel. Instrumentman 1 and C NAVTRA 101194-C rate training manual. 1973 (ERIC Document Reproduction Service No. ED 082 050). (Careers) (High School)

This manual prepares naval personnel, within the instrumentman specialty, for advancement from first class to chief petty officer.

*146. Bureau of Naval Personnel. Equipment Operator 3 and 2 NACTRA 10640-G rate training manual. 1973 (ERIC Document Reproduction Service No. ED 082 028). (Careers) (High School)

This is a guide which prepares naval personnel, within the equipment operator specialty, for advancement from construction-man to third class equipment operator, and from third class equipment operator to second class equipment operator.

*147. Bureau of Naval Personnel. Gunner's mate G 1 and C NAVTRA 101186-C rate training manual. 1972 (ERIC Document Reproduction Service No. ED 082 010). (Careers) (High School)

This manual prepares naval personnel within the gunner's mate specialty, for advancement to first class and chief petty officer.

*148. Bureau of Naval Personnel. Small arms marksmanship manual, NAVPERS 03863. 1971 (ERIC Document Reproduction Service No. ED 082 013). (Careers) (High School)

The publication covers marksmanship as it applies to the navy.

*149. Bureau of Naval Personnel. Ship serviceman's handbook NAVPERS 101292-A rate training manual. 1971 (ERIC Document Reproduction Service No. ED 082 009). (Careers) (High School)

The publication provides basic information concerning the various ship's service specialties (laundryman, tailor, barber).

*150. Bureau of Naval Personnel. Aircrew survival equipmentman 1 and C NAVPERS 10360-D rate training manual. 1971 (ERIC Document Reproduction Service No. ED 082 013). (Careers) (High School)

This guide prepares naval personnel, within the aircrew survival equipmentman rating, for advancement to first class and chief petty officers.

*151. Bureau of Naval Personnel. Aviation boatswain's mate H 1 and C NAVPERS 10303-B rate training manual. 1971 (ERIC Document Reproduction Service No. 082 021). (Careers) (High School)

This is a guide for advancement of naval enlisted personnel to first class and chief petty officers.

*152. Bureau of Naval Personnel. The 3 11/50 gun NAVPERS 10110. 1965 (ERIC Document Reproduction Service No. ED 082 011). (Careers) (High School)

This is an on the job training guide (self study) for naval enlisted personnel.

153. Burton, R. Sea never dry? Sea Frontiers, 1975, 21, 362-370. (Fish)

*154. Burwell, C. B. Desalting and nuclear energy. Physics Teacher, 1971, 9 (1), 67-74. (Methods)

The author discusses methods of desalting sea water. Some of those methods are membrane separation, distillation, and crystallization.

155. Business Weekly. Charting the rules for mining the sea. Business Weekly, 1976, 33-34. (Law)

*156. Butler, E. B. Eighth grade marine science: resource units. 1977 (ERIC Document Reproduction Service No. ED 135 659). (Curricula) (Grade 8)

The unit is designed for grade eight students who already possess some background in science. It emphasizes chemical, biological and physical oceanography.

157. Butzow, J. Clams & other critters. Northern New England Marine Education Project, Orono, Maine, University of Maine, 1978. (Curricula) (Grade K)

*158. Caless, T. W. Plan for implementing an information system for marine sciences. 1968 (ERIC Document Reproduction Service No. ED 036 300). (Methods)

The author discusses the need for a marine science information retrieval system. He points out that in 1968 there were 25,000 citations in the marine science field and that the number of citations were increasing at the rate of 20% per annum.

*159. Calhoun, O. H. Agri-business, national resources, marine science; grade 7, cluster V. 1972 (ERIC Document Reproduction Service No. ED 089 002). (Careers) (Grades 7-12)

This document provides a list of career opportunities available in the marine science area.

*160. California University. Oceans: our continuing frontier. newspaper articles for the fifth course by newspaper, courses by newspaper. 1977 (ERIC Document Reproduction Service No. ED 138 507). (Methods)

This document is comprised of sixteen newspaper articles. They served as a basis for a course about the oceans by newspaper.

*161. Callaghan, S. S. Teachers activity guide to coastal awareness. marine bulletin 23. 1977 (ERIC Document Reproduction Service No. ED 138 462). (Curricula)

This activity book is a multi-disciplinary approach to marine education. The four general subject areas with which it deals are: (1) language arts, (2) science and mathematics, (3) social studies, and (4) art and music.

*162. Callaghan, S. S. Down where the water is: a coastal awareness activity book. marine bulletin no. 22. 1977 (ERIC Document Reproduction Service No. ED 138 463). (Curricula)

This activity was designed to inform youngsters about the importance and use of coastal resources.

*163. Campbell, J. A. Eco-chem. Journal of Chemical Education, 1975, 52 (3), 171. (Curricula)

It has been suggested that when barnacles leave the free floating stage in their life cycle, they show a preference for the type of surface on which they settle. The author of this article suggests a method by which the truth of this suggestion may be investigated by students.

*164. Canadian National Committee. Water films, 2nd edition, 1965-1970. 1974 (ERIC Document Reproduction Service No. ED 067 224). (Bibliographies)

The document lists 455 entries. The entries are annotated and the sources from which the films may be obtained are included.

*165. Canadian Vocational Journal. Training caribbean trawlermen for the future. Canadian Vocational Journal, 1975, 11 (2), 10-15. (Careers)

With the use of two multi-purpose fishing boats, the Caribbean Fishery Development Institute has begun training 45 persons in an 11 month course which covers all aspects of the marine environment.

*166. Caprico, M. W., & Jones, G. V. A water sampler. American Biology Teacher, 1967, 29 (7), 541-543. (Equipment)

The authors describe the construction of an inexpensive water sampler which could be homemade.

*167. Carlander, K. D. What does a fishery biologist do? American Biology Teacher, 1958, 20 (5), 200-202. (Careers)

This is a day by day account of the work of a fishery biologist. The author also discusses the education required in order to become a fishery biologist and sources of employment for people so trained.

168. Carlson, M. M. The development of equipment for underwater exploration. Unpublished masters thesis, Danbury State College, 1965. (Equipment)

169. Carpenter, E. J. & Price, C. C. Marine oscillatoria (trichodesmium): explanation of aerobic nitrogen fixation without heterocysts. Science, 1976, 191, 1278-1280. (Microorganisms)

170. Carr, A. P. Operation mermaid. International Wildlife, 1976, 6, 12-17. (Manatees)

171. Carr, A. P. Ever changing sea level. Sea Frontiers, 1974, 20, 77-83. (Oceanography)

*172. Carter, L. C. Films: oceans. Journal of Geography, 1962, 61, 419-420. (Bibliographies)

This document provides a listing of 12 ocean related films, their locations, running times, dates of publication and costs. Seven of the entries are annotated.

*173. Carter, S. Kingdom of the tides. 1966 (ERIC Document Reproduction Service No. ED 022 611). (Tides)

This publication discusses every aspect of tides. It is available from Hawthorn Books, Inc., 70 Fifth Ave., New York, N. Y. 10011.

*174. Carver, A. Modern teaching methods and the merchant navy. 1967 (ERIC Document Reproduction Service No. ED 023 961). (Methods)

The author discusses methods of training English merchant sailors. The publication includes a discussion of the use of 8 mm films, programmed texts, and an appraisal of the methods. The publication is available from National Institute of Adult Education, 35 Queen Anne Street, London, W1, England.

*175. Carver, C. E. The role of engineering in the geophysical sciences. Journal of Engineering Education, 1960, 50 (5), 408-410. (Careers)

This is a discussion of priority areas of marine investigation for the 1960-1970 decade.

*176. Carver, M. B. Sea food and its relation to conservation and child labor laws. Instructor, 1953, 62 (7), 48. (Curricula) (Grades 4-6)

This is a grades 4-6 marine science unit. It includes fishing methods, laws, and some aspects of bivalve life cycles.

*177. Castellani, M. L. Guide to marine ecological research: a curriculum for secondary students. 1975 (ERIC Document Reproduction Service No. ED 106 089). (Curricula) (High School)

The program was developed with the aid of funding from Title III ESEA. The publication is available from Contra Costa County Department of Education, Pleasant Hill, California. The program pays special attention to the king salmon, the stripped bass, and water quality. In the course of their study, students study plankton populations and sample a mud flat in the San Francisco Bay area.

*178. Cathers, L. D., Rudiger, C. E., & Shepard, R. J. Marine technology and national organization for undersea development. The Decade Ahead, 1970-1980. Washington: Marine Technology Society, 1969. (Careers)

The authors point out that marine engineering and technology are the key to profitable exploration, development and utilization of the sea.

*179. Cavelti, J. E. Concerning the oceans. Journal of Chemical Education, 1947, 24, 406-412. (Chemistry)

This article provides a description of the chemical content of the world ocean.

*180. Chaffee, A. Salmo the salmon. American Childhood, 1953, 38 (5), 62. (Fish) (Grades K-8)

Salmo the salmon is a discussion of how salmon lay eggs, how the embryonic fish feed, what salmon eat, how they change color as they grow and how they head (Atlantic salmon) for the Atlantic.

*181. Chaffee, A. Fundy, the feathered auto-gyro. American Childhood, 1950, 35 (9), 56-57. (Birds) (Grades K-8)

This is a discussion of the puffins which nest on Machias Seal Island in the Bay of Fundy. When nesting, the male puffins take turns with the females keeping the eggs warm. Puffins have webbed feet, nest on the ground, and sit on their eggs for 36 days.

*182. Chaffee, A. Party at the seashore. American Childhood, 1948, 33 (5), 56. (Crabs) (Grades K-8)

The author discusses the hermit crab, where he lives, how he feeds, who his predators are, and other information concerning his life cycle.

*183. Chaffee, A. Lophus, the sea lion. American Childhood, 1948, 33 (9), 56-57. (Sea Lions) (Grades K-8)

This is a discussion of the events in the life of a sea lion as it grows. The author includes information about the seals predators, and how seals warn each other of danger.

*184. Chaffee, A. The little red shrimp and the drifters. American Childhood, 1947, 33 (4), 58-59. (Plankton) (Grades K-8)

Plankton were discussed in an elementary manner in this article. The discussion also includes information concerning the types of organisms which feed on plankton.

*185. Chan, G. L. Effects of visitors on a marine environment. American Biology Teacher, 1972, 34 (6), 319-321. (Pollution)

Visitors to the marine environment of Marvin County, California from schools especially are causing people pollution. They leave various items at the visitation sites and through collection practices cause destruction. There appears to be a need for some type of conservation program.

*186. Chan, G. L. The education and training of marine technicians. 1968 (ERIC Document Reproduction Service No. ED 025 238). (Careers) (High School)

As of the publication date there was a need for marine technicians in California. The author also discusses what the marine technician does, the types of training he or she needs and how various jobs within the field are classified.

*187. Chapman, F. L. Marine science film catalog. 1970 (ERIC Document Reproduction Service No. ED 052 049). (Bibliographies)

48 films and filmstrips are listed alphabetically. Each entry includes the producer, recommended grade level, running time, a summary of content, and suggestions for possible uses. Mention is also made of 300 35 mm slides of still life forms which are available from the marine science center of Carteret County Public Schools, Beaufort, N. C. This document was developed with funding from Title III of ESEA.

*188. Chapman, F. L. The sea and modern man. 1970 (ERIC Document Reproduction Service No. ED 046 737). (Curricula) (Grade 6)

The unit was developed with the aid of Title III funds of ESEA for Carteret County Public Schools, Beaufort, N. C. It was designed as a three week unit for grade 6 and considers man's role in using coastal resources and his subsequent effect on the environment. The unit is divided into food and recreation, transportation, and minerals and conservation subsections.

*189. Chapman, F. L. The sea and its boundaries. 1970 (ERIC Document Reproduction Service No. ED 046 735). (Curricula) (Grade 8)

With the aid of Title III funds of ESEA, Chapman developed this 3 week unit for Carteret County, North Carolina public schools. The unit is divided into tides and physical oceanography, waves, and beaches subsections.

*190. Chapman, F. L. Eighth grade unit, sea--restless giant. 1968 (ERIC Document Reproduction Service No. ED 020 053). (Curricula) (Grade 8)

The unit, which was developed for the Carteret County, N. C. public schools, deals with waves, tides, currents, ocean floors, beaches, and other ocean phenomena. The unit includes a vocabulary and a discussion section.

*191. Chapman, F. L. Marine science film catalog, movies, filmstrips and slides. 1967 (ERIC Document Reproduction Service No. ED 019 252). (Bibliographies)

The bibliography was developed with the aid of Title III ESEA funds and includes annotated lists of 16 mm films, 35 mm slides, and 35 mm filmstrips. The entries are categorized according to title, producer, and topic. In addition, applicable grade levels are suggested for each entry. The films, slides, and strips are available from Carteret County Public Schools, Beaufort, N. C.

*192. Charlier, P. S., & Charlier, R. H. A case for oceanography at the inland school. Science Education, 1971, 55 (1), 15-20. (Curricula)

The authors discuss the need for marine science education, especially for teachers.

193. Charlier, P. S., & Charlier, R. H. Proposed pre-college oceanography. Earth Science Curriculum Project Newsletter, 1969, 19, 6-7. (Curricula)

194. Charlier, P. S., Charlier, R. H. & Gordon, B. L. Oceanography for pre-college students. Illinois Schools Journal, 1968, 48 (1), 39-46. (Curricula)

195. Charlier, R. H. Oceanography in grade school: a comment. Ocean Industry, 1969, 4 (2), 5-6. (History)

*196. Charlier, R. H. Manpower and oceanographic education in the United States. Rock and Minerals, 1969, 44 (8), 563-569. (Careers)

The author provides a discussion of the growth of oceanography from 1928-1969. The author suggests that at the time of printing the needs in oceanography had outdistanced the personnel that were available. The article also includes data from a questionnaire sent to 3,000 precollege teachers. The questionnaire showed that 11% of the respondents took a course in oceanography while in college, and that these 11% had less than 15 semester hours in marine sciences to their credit.

*197. Charlier, R. H. Growth of oceanographic education in the United States. Limnology and Oceanography, 1966, 11 (4), 636-640. (History)

The growth of college level oceanography in the U. S. is discussed for the 1928-1966 period. The first course in oceanography in the U. S. was offered at the University of Washington in 1928. He also discusses the development of graduate level programs and points out that by 1966 there were 24 in the U. S.

198. Charlier, R. H., & Charlier, P. S. Oceanology as a liberal arts subject. Synergist, 1970, 2 (3), 2-14. (Curricula)

199. Charlier, R. H., & Charlier, P. S. A general oceanography course and "sea-camp" for teachers. Science Education, 1969, 53 (2), 105-106. (Curricula)

200. Charlier, R. H., & Charlier, P. S. Oceanography programs for teachers and for grade and high school students. Maritimes, 1969, 23 (3), 6-7. (Curricula)

201. Charlier, R. H., & Charlier, P. S. Sea camp for teachers and beginners. The Professional Oceanographer, 1968, 20 (3), 209-210. (Curricula)

202. Chasan, D. J. Salmon: bitter fruit of the pacific. Audubon, 1975, 77, 8-23. (Fish)

203. Chase, J. W. The determination of criteria for the establishment of a marine biological research station and selection of a site on the New England coast. Unpublished masters thesis, Boston University, 1962. (Methods)

204. Chave, K. E. Chemical reactions and the composition of sea water. Journal of Chemical Education, 1971, 48 (3), 148-150. (Chemistry)

205. Chemistry, Fate of the dolphin. Chemistry, 1974, 47, 24-25. (Dolphins)

206. Chemistry, Penguin. Chemistry, 1974, 47, 3. (Birds)

*207. Chemical and Engineering News. Organometallic polymers targeted at barnacles. Chemical and Engineering News, 1975, 53 (1), 18-19. (Chemistry)

> Navy scientists suggest a group of compounds which show promise for keeping barnacles and other marine organisms from attaching to ship hulls. These organisms increase hull drag and so increase fuel consumption.

*208. Chemical and Engineering News. Effects of pollutants on marine life probed. Chemical and Engineering News, 1973, 51 (51), 17-18. (Pollution)

> Studies are being conducted to determine the longterm effects of heavy metals, synthetics, and petroleum hydrocarbons on the natural marine ecosystem.

*209. Chenault, J. Some fish resemble horses. American Childhood, 1952, 38 (3), 60-61. (Sea Horses) (Grades K-8)

> There are about 50 species of warm water sea horses. They range in size from 2 to 12 inches, cling by their tails and carry their babies in their pouches.

*210. Cherkis, N. Z. A glossary of world bathymetric terms and their English language equivalents. 1970 (ERIC Document Reproduction Service No. ED 047 944). (Dictionaries)

This is a two part compilation of terms used on bathymetric charts. The terms are presented in 27 languages.

*211. Chester R., & Riley, J. P. Oceanography. Education in Chemistry, 1973, 10 (4) , 126-127. (Careers)

The author describes the scope of chemical oceanography (including the sciences involved in chemical oceanography) and the various ways that people train to become chemical oceanographers.

*212. Church, P. E. Labrador current does not reach the United States coast. The Journal of Geography, 1935, 35 (9), 375-376. (Currents) (High School)

There is evidence to indicate that the Labrador current does not reach the coast of Maine.

213. Church, R., & Church, J. Return from extinction. Saturday Evening Post, 1974, 246, 70-71. (Sea Otter)

214. Christy, T. F. Realities of ocean resources. Marine Technology Society Journal, 1969, 3 (1), 33-38. (Careers)

215. Clapp, D. E. Adaptions in the area of marine bioluminescence. Unpublished masters thesis, Boston State College, 1966. (Methods) (High School)

216. Clark, E. Strangest sea: red sea. National Geographic, 1975, 148, 338-343. (Microorganisms) (High School)

*217. Clark, K. Seals. The Grade Teacher, 1946, 63 (5), 42-43. (Seals) (Grades K-8)

Students study portions of the life cycle of the seal as well as the various aspects of the sealing industry in the arctic. The article also privides some information concerning the history of the sealing industry.

*218. Clark, K. Baby seal learns to swim. The Grade Teacher, 1946, 63 (5), 22-23. (Seals) (Grades K-8)

In this story of a seal rookery, the early life of the seal is discussed. Included in the discussion are the seals' early attempts at learning how to swim.

*219. Clark, R. Marine & small engines; glossary of key words. vocational reading power project. 1972 (ERIC Document Reproduction Service No. ED 086 851). (Dictionaries) (High School)

The publication was developed with the aid of title III ESEA funds, and intended to assist students in moving toward mastery in certain vocational education courses. Two definitions are provided for each term.

*220. Clarke, G. L. Light as a limiting factor for aquatic animals and plants. American Biology Teacher, 1939, 1 (7), 150-154. (Methods) (High School)

Light is a limiting factor in oceanic species composition. As well as other information, the author presents information on light absorption in several different types of areas.

*221. Cleveland, L. J. Family life salmon style. Instructor, 1973, 83 (3), 112. (Methods) (Grade 1)

The first grade at Folsom-Corelova United School District, Northern California studied the life cycle of the salmon. As part of their study, they made pictures, and name tags shaped like salmon. They also took a field trip to watch salmon climb ladders at American River.

*222. Clifton, H. E. Tektite 1, man-in-the sea project: marine science program. Science, 1970, 168 (3932), 659-663. (Careers)

The article describes a project in which 4 men spent 60 days 15 meters beneath the sea. The author describes their habitat and the research they carried out while they were involved with the project.

*223. Clingman, O. Biological diver under antarctic ice. The Science Teacher, 1966, 33 (9), 23-27. (Careers)

A scientific program in the antarctic is discussed. The article explains how diving under the ice is accomplished and in addition provides some information about antarctic species and their special adaptions.

224. Cocca, T. A. Evaluation of salt water conversion methods. Unpublished masters thesis, Southern Connecticut State College, 1968. (Methods) (High School)

*225. Cockran, T. Oregon students help prepare impact statements. American Biology Teacher, 1973, 35, 518-520. (Methods)

As a result of a prospective land fill in Coos Bay, Oregon to extend a runway, 20 high school students were asked to contribute a large block of time to cataloging the area and writing an impact statement.

*226. Coggins, P. et al. Marine occupations conference (Southern Maine Vocational Technical Institute, South Portland, Maine, April 5, 1974). Maine sea grant bulletin 9. 1977 (ERIC Document Reproduction Service No. ED 137 122). (Careers) (High School)

This is a collection of papers which was presented at the conference. It provides an overview of the kinds of occupations open in the marine field, and the requirements which must be filled in order to get into these fields.

*227. Cohen, M. 1960-69 cumulative index of articles related to oceanography and limnology education in the science teacher. 1970 (ERIC Document Reproduction Service No. ED 040 072). (Bibliographies)

The articles are indexed according to title, author, and topic. The document is available in hard copy from National Science Teachers Association, 1201 16th Street, N. W., Washington, D.C. 20036.

228. Coker, R. E. This great and wide sea: an introduction to oceanography and marine biology. New York: Harper & Row, 1962. (Text)

229. Cole, D. Shellfish or sea otters? plan to manage the otter population on the California coast. Sea Frontiers, 1975, 21, 194-202. (Sea Otters)

*230. Cole, M. Sea gulls. The Grade Teacher, 1953, 70 (10), 17. (Curricula) (Grades K-6)

The author describes a teaching unit involving gulls.

*231. Cole, R. C. Science interpretive program-spermaceti cove interpretive center. 1967 (ERIC Document Reproduction Service No. ED 020 898). (Curricula) (Grades 5 & 6)

This article describes a program for grades 5 & 6 titled, "A Handful of Sand." The program development was supported by Title III ESEA and intended to be used in Middletown, N. J. schools.

232. Coleman, N. Shell-less molluscs: sea slugs or nudibranchs. Sea Frontiers, 1974, 20, 238-242. (Macroorganisms)

233. Colin, P. L. Mini-prowlers of the night reef: the cardinal-fishes. Sea Frontiers, 1974, 20, 139-145. (Fish)

234. Colinvaux, P. Why the sea is blue. Yale Review, 1974, 64, 135-142. (Oceanography)

*235. College Management. A model in cooperation. College Management, 1970, 5 (12), 11. (Methods) (High School)

Eight New York area universities came together to found the New York Ocean Science Laboratory. The laboratory's primary purpose is to help graduate students. However, the laboratory is used by high school teachers and students in the summer.

236. Colwell, R. R., et al. Marine and estuarine microbiology laboratory manual. Baltimore: University Park Press, 1975. (Methods) (High School)

*237. Commagere, R. Salt in the sea. The Grade Teacher, 1954, 72 (2), 79. (Curricula) (Grades K-8)

This article presents a plain language discussion of the sea's salinity. The article also presents an excellent salinity related in-class activity.

*238. Commission on Marine Science, Engineering and Resources. Industry and technology: keys to oceanic development, volume 2, panel reports of the commission on marine science, engineering and resources. 1969 (ERIC Document Reproduction Service No. ED 056 854). (Reports)

This is an assessment of the national marine effort as of 1969. The commission, at that time, recommended the consolidation of some parts of the effort.

*239. Commission on Marine Science, Engineering and Resources. Science and the environment panel reports of the commission on marine science, engineering and resources. 1969 (ERIC Document Reproduction Service No. ED 045 452). (Reports)

Recommendations are made here for an overall national marine program. The author also reviews the status of marine education as of the date of publication.

*240. Conger, P. S. Lesson of the diatoms. American Biology Teacher, 1956, 18 (6), 187-193. (Microorganisms)

The author discusses all aspects of the life cycle of diatoms. In his discussion he points out how they help the environment.

*241. Congress of the United States. Maritime education and training. Hearings before the subcommittee on merchant marine and fisheries. House of representatives. Ninety-fourth congress. First session. 1976 (ERIC Document Reproduction Service No. ED 123 451). (Careers)

The hearings focused on bills to increase the subsistence payments to students at state maritime academies and bills to provide for an integrated system of education and training of officers for the U. S. Merchant Marine.

*242. Congress of the United States. Effects of man's activities on the marine environment: committee on commerce, United States senate, ninety-fourth congress, first session, committee print. 1975 (ERIC Document Reproduction Service No. ED 116 934). (Reports)

This document presents a discussion of national and international pollution as well as activities for pollution control and abatement.

*243. Congress of the United States. Hearings before the ad hoc committee on maritime education and training of the committee on merchant marine and fisheries, ninety-third congress, second session on officer requirements, and session on maritime education regarding safety at sea. Serial No. 93-44. 1974 (ERIC Document Reproduction Service No. 107 845). (Careers)

This is a listing of the merchant marine supply and demand predictions through 1984. The document also includes a seaman's employment analysis.

*244. Congress of the United States. National sea grant college program authorization, Joint hearing before the subcommittee on oceans and atmosphere of the committee on commerce and the subcommittee on labor and public welfare, United States senate, ninety-third congress, fifth session on S 1262 and H. R. 5452. 1973 (ERIC Document Reproduction Service No. ED 096 105). (Careers)

This document presents the goals of existing Sea Grant programs at the time.

245. Connell, D. & MacGregor, P. K. Sea meadows of westernport. Sea Frontiers, 1975, 21, 331-339. (Seashore)

*246. Contra Costa County Department of Education. Marine ecology research resource units, grades 7-9. 1975 (ERIC Document Reproduction Service No. ED 106 088). (Curricula) (Grades 7-9)

The program was developed with the aid of funding from Title III of ESEA. The units include geology, geography, climate and weather, wave and tide action, and currents. The materials are designed to be infused into the already existing curriculum, and includes background information for teachers.

*247. Contra Costa County Department of Education. Handbook of the techniques and guides for the study of the San Francisco bay-delta-estuary complex, part 4, Key to coastal marine fishes of California. 1971 (ERIC Document Reproduction Service No. ED 086 485). (Keys)

This is a guide to identification of fishes which inhabit the area. It includes descriptions and illustrations.

*248. Contra Costa County Department of Education. Handbook of techniques and guides for the study of the San Francisco bay-delta-estuary complex, part I, Monitoring techniques for the measurement of physio-chemical and biological parameters. 1971 (ERIC Document Reproduction Service No. ED 086 482). (Methods)

This is a guide to help teachers and students gather data about the Bay area, and includes techniques and procedures for measuring the ecology of the environment. The guide specifically deals with (1) physical and chemical factors which affect the environment, (2) techniques used in studying plankton populations, and (3) techniques used in studying bacterial populations.

249. Corkin, C. & Picker, L. Whale multi-disciplinary studies. Northern New England Marine Education Project, Orono, Maine, University of Maine, 1978. (Curricula) (Grade 5)

250. Corrigan, A. W. Old ship launches new lives. Manpower, 1970, 2 (11), 21-25. (Careers)

*251. Cory, C. H. An evaluation of computerized tests as predictors of job performance: differential validity for global and job element criteria. 1976 (ERIC Document Reproduction Service No. ED 123 248). (Careers)

The report presents data concerning the validity of tests for measures of on-job performance within several navy ratings.

252. Cottrell, E. J. Successful crabbing. Camden Me.: International Marine Publishing Company, 1976. (Text)

*253. Council on Environmental Quality. Ocean dumping, a national policy. A report to the president prepared on environmental quality. 1970 (ERIC Document Reproduction Service No. ED 055 891). (Reports)

The publication lists locations, quantities, composition, trends, pollution and international aspects of ocean dumping.

254. Cousteau. J. Y. Perils and potentials of a watery planet. Saturday Review World, 1974, 1, 41-42. (Oceanography)

255. Cox, J. L. DDT residues in marine phytoplankton increases from 1955 to 1969. Science, 1969, 170 (3953), 71-73. (Pollution) (High School)

*256. Cox, R. T. Electric fish. American Journal of Physics, 1943, 11 (1), 13-22. (Fish)

The author describes some of the life of the electric fish, its history and its science. The author also relates its electrical ability to Ohm's law.

257. Cox, V. Oceanic gamble; U. N. law of the sea conference. Newsweek, 1976, 87, 13. (Law)

258. Craig, R. A. The selection and organization of scientific facts, concepts and principles to be included in a course of study of oceanography for secondary school. Unpublished masters thesis, Northern Illinois University, 1962. (Curricula)

*259. Cranston School Department. Marine and environmental studies field manual. 1977 (ERIC Document Reproduction Service No. ED 141 175). (Curricula) (High School)

The manual was developed to be used with a field-oriented high school oceanography course. The units include both biological and physical oceanography.

260. Craven, J. P. Western civilization and the world ocean. Oceans, 1969, 1 (1), 33-37. (History)

261. Crenshaw, N. Field techniques in marine biology. American Biology Teacher, 1977, 39 (6), 376-378. (Methods)

*262. Cummings, M. W. University of California sea grant college program, annual report 1973-1974. 1974 (ERIC Document Reproduction Service No. ED 111 647). (Reports)

The document lists the California Sea Grant activities for the inclusive period.

*263. Cummings, M. W. University of California sea grant college program, annual report 1972-1973. 1974 (ERIC Document Reproduction Service No. ED 111 646). (Reports)

This is a summary of California Sea Grant activities for the inclusive period.

*264. Cuzon du Rest, R. P. Films on oceanography. 1969 (ERIC Document Reproduction Service No. ED 045 433). (Bibliographies)

The publication is available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. The films listed in this publication are catalogued as general oceanography, biological, chemical, engineering, geology, physics. The document also includes running time, and type of film and age level of the audience.

*265. Dade County Public Schools. Authorized course of instruction for the quinmester program. Science; recreation and the sea; oceanography; marine ecology of south Florida, and invertebrate marine biology. 1971 (ERIC Document Reproduction Service No. ED 062 175). (Curricula)

The units of this curriculum package include basic seamanship skills, physical oceanography, local marine biology, invertebrate marine biology, marine ecology, and chemical oceanography. All of the units assume a background in biology or chemistry and the publication lists sources of audio visual materials.

*266. Daniels, R. W. et al. Automated operator instruction in team tactics. 1971 (ERIC Document Reproduction Service No. ED 061 705). (Careers)

An experiment was conducted to see if team training tactics in Navy tactics trainers were sufficient or would it be necessary to develop a new trainer.

267. Daubin, S. C. The role of institutions. Educating and training tomorrow's oceanographers. Washington, D. C., Conference of the American Management Association, 1969. (Careers)

268. Davidson, B. J. & Stephan, C. R. Education in ocean engineering. Offshore Technology Conference, 1969, 1 (2), 197-300. (Careers)

*269. Davis, M. C. Hands at the edge of the sea. American Biology Teacher, 1963, 25 (1), 51-52. (Methods) (Grades 7-12)

The author discusses the actions of starfish and sea anemone's.

*270. Day, R. S. Investigation of the reaction of high school students to a curriculum oriented toward oceanography. 1971 (ERIC Document Reproduction Service No. 057 407). (Curricula) (High School)

This is the evaluation of a school program which was made more relevant to the physical surroundings of the school. All segments of the school program were oriented toward oceanography.

*271. De Blig, H. J. The sea fishing industry of South Africa. The Journal of Geography, 1958, 57, 135-142. (Fish)

This article includes a discussion of the fishing industry, physical factors which affect it, and the methods used in South African fishing.

272. De Julio, E. An oceanography course for gifted students at Mozart public school. Chicago, Northeastern Illinois State College, 1969. (Curricula)

*273. Dean, E. N. Flying fish. American Childhood, 1951, 37 (4), 59-60. (Fish) (Grades K-8)

Flying fish have the ability to jump out of the water. Their young ride at the surface and when being chased by predators, jump out of the water.

*274. Dean, E. N. Sea and garden anemones. American Childhood, 1951, 36 (7), 58-60. (Macroorganisms) (Grades K-8)

When a sea anemone feeds, food is rejected if it is not the correct type. The anemone immobilizes prey by stinging prior to having a meal.

*275. Dean, E. N. Beautiful sea gulls. American Childhood, 1948, 34 (1), 57. (Birds) (Grades K-8)

The author discusses various aspects of the gull's life cycle. Gulls eat garbage, nest in swamps and are gregarious.

*276. Dean, E. N. Adult crabs. American Childhood, 1945, 30 (9), 51-52. (Crabs) (Grades K-8)

Several species of crabs are discussed in this article. They include the hermit, spider, horseshoe, and blue. The hermit crab lives in a shell, uses a sponge or an anemone for protection, and the male pulls the female around with a claw.

*277. Dean, E. N. Sea urchins. American Childhood, 1945, 30 (5), 55. (Macroorganisms) (Grades K-8)

The green and giant sea urchins are discussed in this article. The author includes information about how they feed and how many eggs they lay.

*278. Dean E. N. Coral and its cousins. American Childhood, 1941, 26 (5), 46. (Macroorganisms) (Grades K-8)

Corals are animals which colonize to form reefs. In this article, the author disucsses where corals are found.

279. Dean, J. M. The South Carolina coastal environment: 1670-1977. Sea World, Fall 1977, 11-13. (History)

*280. Dean, L. M. The behavioral effects of crowding: definitions and methods. 1976 (ERIC Document Reproduction Service No. ED 119 048). (Careers)

This study looks at the effects of crowding upon working and living conditions on board U. S. Navy vessels.

*281. Department of Commerce. A list of institutions offering degrees in oceanography. 1972 (ERIC Document Reproduction Service No. ED 068 364). (Careers) (High School)

The document lists 52 institutions in 23 states offering degrees in oceanography.

*282. Department of Labor. Employment outlook, environmental scientists, geologists, oceanographers, meteorologists, oceanographers. 1970 (ERIC Document Reproduction Service No. ED 045 400). (Careers) (High School)

283. Devereux, S. Slanting the news to destroy the marsh; effects of offshore power systems, building of floating nuclear power plants on the black river marsh of Jacksonville, Florida. Audubon, 1976, 78, 135-137. (Salt Marsh)

284. Dewees, C. M. & Hooper, J. R. Marine biology. The Journal of Marine Education, 1976, 1 (1), 35-39. (Oceanography)

285. Di Silvestro, V. The beaver. Northern New England Marine Education Project, Orono, Maine, University of Maine, 1978. (Curricula) (Grade 3)

286. Di Silvestro, V. & Picker, L. Coastal indians of northern New England. Northen New England Marine Education Project, Orono, Maine, University of Maine, 1978. (Curricula) (Grade 8)

287. Dieter, H. M. L. & Schouteten, A. P. H. Removal of crude oil from marine surfaces. Journal of Chemical Education, 1972, 49 (1), 19-20. ((Pollution)

288. Dietz, R. S. Iceland: where the mid-ocean ridge bares its back. Sea Frontiers, 1976, 22, 9-15. (Geology)

*289. Difford, W. C. The scuba oceanologist. Instructor, 1965, 74 (10), 86-87. (Careers) (Grades K-12)

The author describes what a person working in this capacity does during his working hours.

*290. Difford, W. C. Research buoys. Instructor, 1965, 74 (9), 68-69. (Oceanography) (Grades K-8)

The author describes the gathering of oceanographic information via the use of research buoys.

*291. Difford, W. C. Project mohole. Instructor, 1965, 71 (8), 72-73. (Oceanography) (Grades K-8)

Moho was a project which attempted to drill through the earth's crust and into the mantle. The author describes this project.

*292. Difford, W. C. The sea can feed us. Instructor, 1965, 74 (7), 122-123. (Fish) (Grades K-8)

Many organisms which reside in the sea are used for food. The author describes these organisms, as well as what other countries of the world are doing in the fish for food line.

*293. Difford, W. C. Living under the sea. Instructor, 1965, 74 (6), 78-79. (Careers) (Grades K-8)

The author describes living and working conditions under the sea and its problems. Some of the problems are related to the bends while others involve helium inhalation.

*294. Difford, W. C. Baby subs that study the sea. Instructor, 1965, 74 (5), 88-89. (Careers) (Grades K-8)

In this article the author describes several deep diving submersibles used in studying the ocean depths.

*295. Difford, W. C. Operation deep dip. Instructor, 1964, 74 (4), 40-41. (Careers) (Grades K-8)

This is a description of an exploration of the ocean depths which was carried on by the navy.

*296. Difford, W. C. The tides. Instructor, 1964, 74 (3), 104-105. (Tides) (Grades K-8)

The author discusses tides, tidal bores, the prediction of tides and the effects of tides in this article.

*297. Difford, W. C. Ocean currents. Instructor, 1964, 74 (2), 58-59. (currents) (Grades K-8)

Ocean currents and counter currents are discussed herein in simple language.

*298. Difford, W. C. Giants of the sea. Instructor, 1964, 74 (1), 144-145. (Macroorganisms) (Grades K-8)

In this article, the author describes physically the conger eel, whale shark, sea turtle, jellyfish, medusa, manta ray, sperm whale, and squid.

299. Difford, W. C. Scientists, and sailors, too, who is an oceanographer? Instructor, 1964, 73 (10), 76-77. (Careers) (Grades 4-12)

300. Difford, W. C. The flip ship. Instructor, 1964, 73 (9), 90-91. (Careers) (Grades 4-12)

301. Difford, W. C. Wanted! more fresh water. Instructor, 1964, 73 (8), 112-113. (Careers) (Grades 4-12)

302. Difford, W. C. Mathew Fontaine Maury. Instructor, 1964, 73 (7), 46-47. (History) (Grades 4-12)

303. Difford, W. C. Ocean highways for shipping. Instructor, 1964, 73 (6), 68-69. (Careers) (Grades 4-12)

*304. Difford, W. C. The instrumentation center. Instructor, 1964, 73 (5), 24-25. (Careers) (Grades K-12)

The author describes what it means to be an oceanographer.

*305. Difford, W. C. The floor of the Pacific Ocean. Instructor, 1963, 73 (4), 80-81. (Geology) (Grades K-12)

This is the history and physical geography of the Pacific Ocean.

306. Difford, W. C. The floor of the Atlantic Ocean. Instructor, 1963, 73 (3), 18-19. (Geology) (Grades K-12)

307. Difford, W. C. Research vessel atlantis from woods hole. Instructor, 1963, 73 (2), 24-25. (Careers) (Grades K-12)

308. Difford, W. C. Going down in the trieste bathyscope. Instructor, 1963, 73 (1), 34-35. (Oceanography) (Grades K-12)

*309. Dobbs, M. C. Send us a museum. Instructor, 1974, 83 (9), 58. (Facilities)

Even students in special education classes can learn about the sea. In this article, the author describes such a class.

310. Dodge, R. A. AIBS education review, vol. 5, no. 1. 1977 (ERIC Document Reproduction Service No. ED 128 160). (Curricula)

*311. Donnelly, D. P. The atmosphere and the ocean: a field study course. American Journal of Physics, 1973, 41 (5), 664-669. (Methods) (High School)

A field trip was taken by a group of college students to an ocean area. During the trip, they studied the radius of the earth, wind velocity, beach profiles, surface currents, sediment transport, and wave measurements.

312. Doubilet, D. Rainbow world beneath the red sea. National Geographic, 1975, 48, 44-65. (Oceanography)

313. Douglas, J. H. Oysters, algae and sewage. Science News, 1974, 106, 170-171. (Pollution)

314. Dow, G. N. Life on the three mile reef. Conservationist, 1974, 28, 3 31-33. (Oceanography)

*315. Dow, R. L. The use of biological, environmental and economic to predict supply and to manage a selected marine resource. American Biology Teacher, 1966, 28 (1), 26-30. (Methods) (High School)

Temperature versus catch information is and methods of data analysis are provided herein.

316. Doyle, B. Marine education advances in New York state. Coastlines, 1978, 9 (1), 4-5. (Curricula)

*317. Driscoll, A. L. A model marine science laboratory, north kitsap marine environmental center. 1972 (ERIC Document Reproduction Service No. ED 080 345). (Methods)

This document was developed with the aid of Title III funds from ESEA. It discusses the development of a marine science laboratory for teaching and research and includes sample activities and materials used in the instructional program.

*318. Dubach, H. W., & Taber, R. W. Questions about the oceans. 1968 (ERIC Document Reproduction Service No. ED 033 858). (Methods)

The 100 most asked questions by students at the 17th annual science fair (1966) are contained in this paper. They cover the areas of physical, chemical and geological aspects of the oceans, marine biology, marine history, and methodological oceanography.

*319. Duffy, T. M. Language skills: a prospectus for the naval service. 1977 (ERIC Document Reproduction Service No. ED 133 683). (Careers) (High School)

The paper deals with the descrepancy between the reading ability of naval personnel and the level of reading material said personnel must deal with in the course of a naval career.

320. Duffy, L. R. Design of training systems utility assessment: the training process flow and system capabilities/requirements and resources models operating in the TRAPAC environment. 1976 (ERIC Document Reproduction Service No. ED 126 342). (Careers)

*321. Duran, J. C. Sea urchin development: an investigative exercise. American Biology Teacher, 1971, 33 (9), 539-541. (Methods)

The injection of KCl into sea urchins will cause them to extrude their eggs and sperm. Once viable eggs and sperm are available, fertilization and the following embryological development may be observed through a microscope.

322. Earle, S. A. Life springs from death in truk lagoon. National Geographic, 1976, 149, 578-613. (Oceanography)

*323. Earney, F. C. F. Ocean space and seabed mining. Journal of Geography, 1975, 74 (6), 539-547. (Law)

President Truman, in 1945, proclaimed that all the seabed of the contiguous continental shelf seaward to the 600 foot isobath was under United States jurisdiction.

324. Eberhart, J. Ever downward beneath the ocean deep: ocean drilling by glomar challenger. Science News, 1975, 107, 9. (Careers)

325. Edelbrock, J. Manatees sirens of the sea. Oceans, 1975, 8, 66-69. (Manatees)

326. Edelbrock, J. One rock abalone, one happy sea otter. National Wildlife, 1974, 12, 2-3. (Sea Otter)

*327. Education Product Report. Throne marine environmental series. Education Product Report, 1972, 41 (5), 5-7. (Bibliographies)

The article abstracts 6 color film loops. Five of the loops present marine organisms as they function in their environments and the 6th reviews 20 of the organisms.

*328. Eike, R. A. Woods hole diary. American Biology Teacher, 1956, 18 (5), 196-198. (Curricula)

This is the description of a summer program which was conducted at Woods Hole, Ma.

329. Elardi, J. & Yasso, W. E. Brooklyn and the sea: explore the beach. The Journal of Marine Education, 1976, 1 (1), 10-12. (Methods)

330. Ellison, G. Teaching marine studies when you don't know a snipe from a cucumber. Sea World, Fall, 1977, 33-35. (Methods)

*331. Emerson, C. The fisheries. The Grade Teacher, 1937, 54, 16-17. (Careers) (Grades K-12)

The author describes a unit of instruction concerned with the fishing industry. It includes a description of the types of jobs involved.

332. Engelken. R. Solving the jellyfish puzzle. Oceans, 1974, 7, 60-65. (Macroorganisms)

*333. Engle, D. W. X-radiography of marine animals. American Biology Teacher, 1960, 22 (9), 547-548. (Methods)

This is one method of studying marine animals without destroying the specimen.

*334. ERIC Information Analysis Center. Science education information analysis center newsletter. 1968 (ERIC Document Reproduction Service No. ED 020 916). (Bibliographies)

This is a directory of outdoor education programs in the United States.

335. Erize, F. He is always ready to attack; South American sea lions. International Wildlife, 1975, 5, 52-57. (Seals)

336. Ermish, G. Life in the sea. Instructor, 1966, 76 (3), 138-139. (Methods) (Grade 4)

337. Estes, J. A. & Palmisano, J. F. Sea otters: their role in structuring nearshore communities. Science, 1974, 185, 1058-1060. (Sea Otters)

*338. Evangelos, N. J. Enrichment activities in environmental education. 1973 (ERIC Document Reproduction Service No. ED 086 490). (Curricula)

This is a collection of activity units written for elementary teachers and available from Merrimack Education Center, Chelmsford, Ma. Some of the marine units are useful in other than the locale where they were written.

*339. Evans, G. O., & Panshin, D. A. Harnessing the ocean potential. Extension Service Review, 1970, 41 (8), 8-9. (Careers)

Oregon State University Sea Grant provides extension services to Oregon commercial fisheries. Those services are described in this article.

*340. Eyster, C. J. Oceanology. Science Teacher, 1975, 42 (5), 52-53. (Methods) (High School)

A six week summer course was designed for 30 students at Dana Junior High School, San Pedro, California. The course was divided into field trips, slide sessions, lectures, filmstrip sessions, map activities, discussions, guest speakers, films, and individual projects.

341. Fairbridge, R. W. Shellfish-eating preceramic indians in coastal Brazil. Science, 1976, 191, 353-359. (History)

342. Fallon, J. How to read a beach. Field and Stream, 1976, 81, 76-78. (Beaches)

*343. Falmouth Public Schools. High school oceanography. 1970 (ERIC Document Reproduction Service No. ED 043 501). (Curricul (High School)

This series of papers was designed to aid high school teachers in organizing a course in oceanography. The papers cover the areas of introductory oceanography, geology of the ocean, the continental shelves, physical properties of sea water, waves, tides, ocean circulation, air sea interaction, sea ice, chemical oceanography, marine biology, origin and development of life in the sea, aquaculture. The collection was developed with the aid of funding from Title III funds from ESEA.

344. Falter, D. H. Tidal currents in San Diego harbor. Unpublished masters thesis, San Diego State College, 1971. (Currents)

*345. Farning, M. Career education: the marine science occupation cluster. 1973 (ERIC Document Reproduction Service No. ED 080 662). (Careers)

Career opportunities in harbor and ship construction, merchant marine activities, longshoring, fishing, fish farming, petroleum exploring and research are discussed in this document.

*346. Farraday, C. L. Precollege oceanography: short course in marine science for high school. American Biology Teacher, 1975, 37 (8), 475-477. (Methods) (High School)

Three day courses in oceanography are offered to high school students by the staff of the state college at Millersville, Pa. The courses are conducted at Wallops Island, Va. on Delaware Bay. The students who participate in this program conduct pretrip activities such as reviewing the invertebrates, setting up salt water aquaria, discecting marine specimens, and formulating questions to be answered on the trip. While on the trip, the students study beaches, marshes, and the open ocean.

347. Fay, R. C. A brief history of the shoreline of southern California. Sea World, Fall 1977, 7-10. (History)

*348. Federal Council for Science and Technology. University curricula in the marine sciences and related fields, academic years 1973-4, 1974-5. 1973 (ERIC Document Reproduction Service No. ED 082 970). (Careers) (High School)

This guide for students and councillors lists 138 institutions offering 25 or more credit hours in marine sciences. Under each institution are listed the courses offered and the degrees which are offered.

*349. Feiro, A. D. The counter current mechanism in biology. American Biology Teacher, 1968, 30, 130-137. (Fish) (High School)

Fish breathing is treated in this article.

350. Feld, L. G. Airships and oceanography. Sea Frontier, 1976, 22, 24-31. (Oceanography)

351. Fibel, L. R. Training of marine technicians by junior colleges. Educating and training tomorrow's oceanographers. Washington: Conference of American Management Association, 1969. (Careers)

352. Fichter, G. S. Shrimp nobody knows. International Wildlife, 1976, 6, 17-19. (Shrimp)

353. Firger, B. A. Lingering look at lobster culture. Oceans, 1974, 7, 26-31. (Food)

354. Fisher, D. W. Marine resources in the decade ahead: development syndromes & strategies. Educating and training tomorrow's oceanographers. Washington: Conference of American Management Association, 1969. (Careers)

*355. Fisher, W. K. The hopkins marine station of Stanford University. The Scientific Monthly, 1929, 29-33. (History)

In this article the author discusses Hopkins marine station which was founded in 1892. The discussion includes the types of research carried on during the station's early years, and other details of its early years.

356. Fletcher, T. C. & Baldo, B. A. Immediate hypersensitivity responses in flatfish. Science, 1974, 185, 360-361. (Fish)

*357. Flora, C. & Swift, A. Rapport and the cyclopean eye. Science Education, 1964, 48 (5), 396-404. (Methods)

The authors discuss a series of seashore field trips.

*358. Florida State University. A taxonomy of marine technicians and technologists and the implications for training them. 1971 (ERIC Document Reproduction Service No. ED 062 509). (Careers)

A three phase study was conducted to: (1) ascertain the education, training and classification characteristics of marine science technicians, (2) suggest the implications to educators, oceanographers, and labor administrators, (3) develop a scheme for classifying marine oriented people in the future. The document is available from the National Technical Information Service in accordance with the instructions provided in the introductory pages of the publication.

*359. Florida State University. Laboratory exercises in oceanography for high schools. Tallahassee, Florida: Florida State University, 1968. (Methods) (High School)

This document is also available from the ERIC Document Reproduction Service, No. ED 018 399, 1967. The laboratory activities were developed by the teachers in a 1967 NSF summer institute in oceanography at Florida State University. The activities include the measurement of temperature, water vapor, pressure, salinity, and density. The document also includes instructions for the construction of measuring equipment.

*360. Foltz, F. A sea horse story. Instructor, 1955, 64, 46. (Sea Horses) (Grades K-4)

This is a story of the life of a sea horse at sea, and is presented in story form.

361. Foott, J. O. Life at the edge of the sea. National Wildlife, 1976, 14, 42-47. (Oceanography)

362. Forbes. Ocean mining: bonanza or bust? Forbes, 1976, 117, 34. (Resources)

*363. Forbes, L. An oceanography field course for the eighth grade. 1969 (ERIC Document Reproduction Service No. 042 622). (Curricula) (Grade 8)

This program was developed with the aid of Title III ESEA funds for the Falmouth, Mass. public school system. The manual includes lesson plans, discussion sections, bibliographies, and field and laboratory procedures.

*364. Forbes, L., Thomson, G. B., & Soderberg, J. Oceanography: a vehicle for integrating science concepts. Science Teacher, 1969, 36 (3), 40-42, (Curricula) (Grade 8)

The authors provide a description of a four week summer course which was conducted at Falmouth, Mass for the eighth grade.

365. Ford, B. Lobster farming: more food and cheaper lobsters for your table. Science Digest, 1974, 76, 74-79. (Food)

*366. Fortner, R. W. Gyotaku: preserve it with a print. Sea World, Fall 1977, 45-56. (Methods)

The author presents a method by which marine awareness may be taught through an art project.

*367. Foster, O. R. Maryland environmental education survey, part one: the Chesapeake Bay as an integral part of the environmental education program. 1975 (ERIC Document Reproduction Service No. ED 107 475). (Curricula)

The author reports the results of a questionnaire sent to people in the Chesapeake Bay water shed area. The prupose of the questionnaire was to determine the type and extent of environmental programs being offered in the area.

*368. Fowler, H. G. Marine propulsion technology program meets the demand. School Shop, 1974, 34 (2), 70-71. (Careers) (High School)

The article provides a description of the marine technology program at Florida Keys Community College. In this program, technicians are trained to maintain and repair engines and selected marine accessories.

*369. Fox, R. P. Life in a New England salt marsh. American Biology Teacher, 1966, 28 (5), 369-372. (Salt Marshes)

This is a discussion of the salt marsh as an ecosystem. In the article, the author points to harm caused by destroying the salt marsh. For example, the salt marsh is the breeding ground for many fish species. Its destruction leads to the loss of certain species in the area of the marsh or perhaps may lead to the extinction of a species.

*370. Fox, W. T. Computer-oriented laboratory exercises for geology and oceanography. Journal of Geological Education, 1969, 17 (4), 125-134. (Methods)

The author of this article describes the use of computers to predict the tides. He also describes other demonstrations and projects which might be used in the classroom to teach oceanography.

*371. Fradiska, J. Ocean currents. (Aids to individualize the teaching of science, mini-course units for grades 7, 8, and 9.) 1977 (ERIC (Document Reproduction Service No. ED 130 907). (Methods) (Grades 7-9)

This is one in a series of booklets designed to provide flexibility in teaching science at the inclusive grade levels. It contains notes on science activities, resource lists, and references.

*372. Fradiska, J. Features of the ocean floor (ocean floor topography). 1977 (ERIC Document Reproduction Service No. ED 130 908). (Methods) (Grades 7-9)

The document contains activities which may be performed in class. It includes a student section containing performance objectives, and a teacher section containing scientific information.

373. Frasier, T. Marine habitats. The Journal of Marine Education, 1976, 1 (1), 40-42. (Methods)

*374. Frey, H. R. Graduate training program in ocean engineering, final report. 1971 (ERIC Document Reproduction Service No. ED 094 039). (Careers) (High School)

This is a description of the activities in which one takes part during the first three years of New York University's ocean engineering program.

*375. Frosch, R. A. University curricula in the marine sciences. 1967 (ERIC Document Reproduction Service No. 016 627). (Careers) (High School)

This is a list of marine science programs at American colleges as of the publication date. The document includes the degrees that are offered and sources of additional information.

*376. Gallagher, J. L. An economical cooling system for aquaria. American Biology Teacher, 1967, 29 (7), 535-536. (Aquaria)

The author provides diagrams and a good discussion of this system.

377. Garrison, L. E. et al. USGS-IDOE leg 3. Geotimes, 1972, 17 (3), 14-15. (Careers)

*378. Garstrang, M. Fueling of the air-sea system. School Science and Mathematics, 1967, 67 (295), 707-716. (Oceanography) (High School)

In this article, the author discusses the sun's energy input into the ocean.

*379. Gee, M. Kits in motion. Science and Children, 1975, 12 (4), 31. (Methods) (Grades K-8)

The British Columbia Provential Museum of Victoria, B. C., Canada provides a marine science education program through their education and extension service. The program is moved from school-to-school by its instructors and is especially designed for schools away from the sea. Students who become involved study chemical and physical oceanography, the diversity of marine life, the interrelationships of marine life, man's dependence on the sea, man's influence on marine life.

*380. Geller, A. Sea cucumbers. American Biology Teacher, 1966, 28 (7), 550-551. (Macroorganisms) (Grades 4-12)

The life style of the sea cucumber is discussed in story style in this article.

*381. Geller, A. Penguins. American Biology Teacher, 1966, 28 (7), 550. (Birds)

The life style of the Penguin is discussed in story style.

382. Gendel, E. G. A unit in oceanography for the junior high school. Unpublished masters thesis, St. Joseph College, West Hartford, Conn., 1968. (Curricula)

383. Genthe, H. C. Sea forest; role of kelp. Oceans, 1975, 8, 50-55. (Oceanography)

*384. Georgia State Department of Education. Field study manual to fresh-water and estuarine habits. 1971 (ERIC Document Reproduction Service No. ED 056 914). (Methods)

This program was designed to take the student into both fresh and estuarine data collection. The publication includes methods of sampling and quantification of data, and evaluating research articles.

*385. Geotimes. Junior-college geology. Geotimes, 1972, 17 (8), 23. (Curricula)

The article summarizes data from a questionnaire sent to 1240 junior colleges. The questionnaire requested information about their eart science courses and instructors.

*386. Geotimes. ERTS & EROS. Geotimes, 1972, 17 (3), 20-23. (Careers)

The article describes an investigation which was proposed to be conducted with the Earth Resources Technology Satellite. The experiment was to be the first which would systematically survey the earth's resources by remote sensing.

387. Gilbert, B. Marvel or madness: the pribilof seals. Reader's Digest, 1976, 108, 17-18. (Seals)

388. Gilbert, B. Marvel or madness: pribilof island seals. Sports Illustrated, 1975, 43, 96-100. (Seals)

389. Gilbert, B. Good man, good show; national whale symposium at Indiana University. Sports Illustrated, 1976, 44, 38-39. (Whales)

*390. Gillie, A. C. & Pratt, A. L. Marine technology programs: where they are and where they are going. 1971 (ERIC Document Reproduction Service No. ED 062 111). (Careers)

This document is available from the American Association of Junior Colleges, 1 Dupont Circle, N. W., Washington, D. C. 20036. It is a summary of the conference on marine science technicians in junior colleges. It includes information concerning training vessels, manpower predictions, and institutions which have such programs.

*391. Gilver, J. B. The seven seas in every laboratory. American Biology Teacher, 1941, 4 (3), 85-86. (Aquaria)

Large test tubes may be used as small aquaria. The author of this article discusses a method by which this might be accomplished.

392. Glneck, R. Ships thru the ages. Northern New England Marine Education Project, Orono, Maine, University of Maine, 1978. (Curricula) (Grade 6)

393. Glneck, R. Ships & seaways. Northern New England Marine Education Project, Orono, Maine, University of Maine, 1978. (Curricula) (Grade 7)

*394. Godfrey, P. L. & Hon, W. Dune detective, using ecological studies to reconstruct events which shaped a barrier island. 1970 (ERIC Document Reproduction Service No. ED 061 060). (Curricula) (High School)

The program was developed with support from Title III ESEA for the Carteret County Public Schools, Beaufort, N. C. In the program, students are exposed to research methods through a series of field exercises.

*395. Goldberg, E. D. The health of the oceans. 1977 (ERIC Document Reproduction Service No. ED 137 069). (Pollution)

This document is a review of international scientific literature concerning pollution of the world ocean.

396. Goldberg, E. G. The process of regulating the composition of sea water. Journal of Chemical Education, 1958, 35 (3), 116-119. (Chemistry) (High School)

*397. Goldberg, I. Evaluation of the program: randall aerospace and marine science program. A title III evaluation project, final report. 1977 (ERIC Document Reproduction Service No. ED 134 413). (Curricula) (High School)

An interdisciplinary program related to aerospace and marine topics was created by students in the 9th and 10th grades in Washing, D. C. The development focused upon experiences in science, mathematics, communication skills, career education, and physical education.

*398. Goodwin, H. L. Marine affairs. Education in Hawaii's future. 1977 (ERIC Document Reproduction Service No. ED 132 042). (Conferences) (Grades K-12)

The publication summarizes the principle conclusions drawn from a four day conference held by the University of Hawaii's Curriculum Research and Development Group and the Department of Curriculum and Instruction. The primary intent was to examine the development of marine curricula for Hawaii's schools. The document includes a rationale for curriculum development in this academic area.

399. Goodwin, H. L. Today's youth in tomorrow's sea. Oregon State University Extension Marine Advisory Program, SG45, June 1977. (Careers)

*400. Gordon, B. L. Pre-college studies in oceanography. American Biology Teacher, 1970, 32 (6), 366-367. (Curricula)

The author discusses the state of the art in pre-college oceanography. He provides information concerning where this type of education is taking place in the U. S. and who is funding it.

*401. Gordon, B. L. Marine careers. 1970 (ERIC Document Reproduction Servive No. ED 055 793). (Careers)

This is a collection of five papers in the marine careers area designed to guide teachers, guidance counselors, and students. They discuss governmental and private jobs in the marine areas.

*402. Gordon, B. L. An ocean science program for pre-college students. American Biology Teacher, 1968, 30, 106-108. (Curricula)

In this article, the author discusses some pre-college programs which are in progress. He points to one in particular which is run by the American Littoral Society.

403. Gordon, B. L. Advisor's handbook. American Littoral Society, 1964. (Text)

*404. Gorsline, D. Marine geology. Geotimes, 1972, 17 (1), 20-21. (Careers)

The article mentions the major research projects in marine geology which were conducted during 1971. It also points to poor career opportunities during that year.

405. Gould, J. A. Maine discovers the mussel. Down East, 1975, 22 (3), 48-51. (Food)

*406. Grade Teacher. Seals and their homes. The Grade Teacher, 1951, 68 (5), 42-43. (Seals) (Grades K-6)

The article considers the history of the seal industry, and the life of the seal. In addition, classroom activities are suggested.

*407. Grade Teacher. The life of a sea gull--a study in elementary science. The Grade Teacher, 1948, 65 (10), 42-43. (Birds) (Grades K-8)

The article provides several pictures of gulls, gull eggs, and gulls nesting on an island off the coast of Rockland, Maine.

*408. Grade Teacher. The fishing industry. The Grade Teacher, 1945, 62 (10), 42-43. (Careers)

The author presents a series of pictures with excellent captions which describes the fishing industry and the life of a Glouchester, Mass. fisherman.

409. Graham, F. Sardine is a vanishing species. Audubon, 1974, 76, 50-56. (Fish)

*410. Graham, J. J. Ocean currents. American Biology Teacher, 1967, 29 (6), 453-458. (Methods) (High School)

Methods of studying ocean currents are suggested in this article.

*411. Graham, L. & Wackerbarth. Old habits of crabs. American Childhood, 1944, 30 (2), 53-54. (Crabs) (Grades K-6)

The author discusses the fiddler crab and another species of Florida land crab which migrates to the sea at breeding time to shed its sexual products.

*412. Graham, L. & Wackernbarth. Noisy fish. American Childhood, 1942, 27 (7), 49. (Fish)

Fish make noises by grating teeth together, grunting, using gill covers as sounding boards, and using air bladders.

413. Grassie, J. P. & Grassie, J. F. Sibling species in the marine pollution indicator capitella (polychaeta). Science, 1976, 192, 567-569. (Pollution)

414. Grave, C. A method of rearing marine larva. Science, 1902, 15, 579-580. (Methods)

415. Gray, J. How fishes swim. Scientific American, Offprint No. 1113, August 1957. (Fish) (High School)

416. Green, L. Death stalks the dungeness crab; crabbing grounds off the California coast. Field & Stream, 1974, 78, 38. (Crabs)

417. Gregg, E. S. Aquarist's bonanza; salt water aquariums. Oceans, 1965, 8, 62-65. (Aquaria)

418. Gregson, A. Biological assessment of river quality. School Science Review, 1973, 55 (191), 295-298. (Methods)

*419. Griff, B. What makes the tides. Instructor, 1970, 80 (4), 33. (Tides) (Grades 4-6)

In this writing, there is a verse used by the author to kick off a unit on tides. The author also discusses the methods he uses in teaching children about tides.

420. Grignon, P. G. In search of whales. Science and Children, 1971, 8 (7), 14-15. (Whales) (Grades K-8)

*421. Grimm, K. G. & Ellis, B. Spotlight on diatomes. American Biology Teacher, 1963, 25 (1), 9-17. (Microorganisms)

This article discusses the palentology, ecology, locomotion, and reproduction of diatomes. It also provides excellent diagrams, and a bibliography.

422. Gunnar, K. Salmon without spawning; hatcheries in the Pacific Northwest. National Wildlife, 1975, 13, 22-23. (Fish)

*423. Guy, D. Cape Hatteras national seashore field project. Science Teacher, 1975, 42 (6), 28. (Curricula)

Students from Norfolk Catholic High School took a trip of one week to Cape Hatteras National Sea Shore. While at the sea shore they studied both chemically and biologically oriented oceanographic topics.

*424. Haan, A. Oceanography in general education. The Journal of Geography, 1950, 50 (7), 294-301. (Curricula)

This author discusses the importance of precollege marine sciences. He also suggests activities for the classroom, and field trip activities.

*425. Hadley, P. Sea wrack. The Grade Teacher, 1951, 68 (10), 36-37. (Oceanography) (Grades K-8)

This article presents various aspects of intertidal life. It is excellent and very easy to understand.

426. Hagen, J. M. Studying fish. Instructor, 1970, 79 (8), 46. (Fish) (Grades K-8)

*427. Hall, E. R. Training effectiveness assessment: volume II, problems, concepts, and evaluation alternatives. Final report. 1977 (ERIC Document Reproduction Service No. ED 137 391). (Careers) (High School)

A study was conducted to clarify issues and problems involved in the assessment of the effectiveness of military training and to evaluate and recommend more objective procedures for determining the effectiveness of Navy training.

*428. Hall, E. R. Training effectiveness assessment: volume I, current military training evaluation programs. Final Report. 1977 (ERIC Document Reproduction Service No. ED 137 390). (Careers)

This study was conducted for the same reasons listed in ED 137 391 above.

429. Hammer, R. M. Pelagic adaptions. Sea Frontiers, 1974, 20, 2-12. (Oceanography) (High School)

*430. Hamming, E. Conversations with earth, a human approach to the earth sciences. Science and Children, 1969, 7 (2), 37-42. (Oceanography) (Grades K-8)

This is a discussion of the hydrosphere, how it affects man, how man affects it, and its effect upon the weather.

431. Hammond, A. L. Undersea storms: experiment in the Atlantic; mid-ocean dynamic experiment. Science, 1974, 185, 244-247. (Oceanography) (High School)

432. Hammond, A. L. Physical oceanography: big science, new technology. Science, 1974, 185, 246-247. (Careers) (High School)

433. Hammond, A. L. Long range weather forcasting: sea temperature anomalies. Science, 1974, 184, 1064-1065. (Weather) (High School)

434. Hammond, A. L. Frontiers of research in atmospheric and marine science. Science, 1974, 183, 736-737. (Careers) (High School)

435. Hammond, A. L. Physical oceanography: planning for a major experiment. Science, 1972, 176 (4032), 268-269. (Careers) (High School)

436. Hammond, A. L. Paleoceanography; sea floor clues to earlier environments. Science, 1976, 191, 168-170. (History) (High School)

437. Hands, R. A. Water waves and ripple tanks. School Science Review, 1974, 55 (193), 778-782. (Methods)

*438. Hansen, D. V. Oceanography for the 1970's. The Science Teacher, 1971, 38 (1), 19-26. (Careers) (High School)

The article discusses who is carrying on ocean research and what types they are doing. The author also discusses the goals of science and calls for a scientifically literate population.

*439. Harnwell, G. P. Submarine physics. American Journal of Physics, 1948, 16 (3), 127-139. (History) (High School)

This is an historical treatment of submarine development. There are sections on propulsion, speed, communications, acoustic properties of sea water, and the use of sound by submarines.

*440. Hawaii, University of. Marine education for the Hawaii marine education council. 1977 (ERIC Document Reproduction Service No. ED 128 187). (Curricula)

The report includes the history of marine education in Hawaii, the goals and objectives of marine education in Hawaii, guidelines for marine education implementation, and a proposed development plan for a marine education curriculum.

441. Hawkins, B. L. The biology of the marine copepod ligriopus californicus. Unpublished masters thesis, Humboldt State College, 1963. (Methods)

*442. Hawkins, H. S. Oceans: our continuing frontier. A study guide for courses by newspaper. 1977 (ERIC Document Reproduction Service No. ED 138 504). (Methods) (High School)

This document is one of several used with a 16 week newspaper course about the oceans. The course covered the fields of history, law, literature, marine sciences and archeology.

443. Hayden, B. P. Storm wave climates at Cape Hatteras, North Carolina: recent secular variations. Science, 1975, 190, 981-983. (Beaches) (High School)

*444. Healey, J. C. Opportunities and occupations in the American merchant marine. Occupations, 1939, 17 (6), 16-23. (History) (High School)

The author describes jobs in the merchant marine, merchant marine requirements, ways in which a person can enter the merchant marine, types of training, methods of advancement, hours, compensation, future trends, and unions. Although this article is dated, it provides an historical perspective of the merchant marine.

445. Hearst, J. Fight chair; effect of Japanese long-lining on Atlantic tuna. Motor Boating and Sailing, 1975, 136, 20-21. (Fish)

446. Heberlein, H. Indus river dolphins. Sea Frontier, 1976, 22, 117-122. (Dolphins)

447. Hedgpeth, J. W. Sea otters: irresistible ecological bodies. Oceans, 1974, 7, 61. (Sea Otters)

*448. Hedgpeth, J. W. Aspects of research in marine biology. American Biology Teacher, 1962, 24 (1), 7-13. (Methods) (High School)

Hedgpeth discusses ways in which high school and college teachers can stimulate minds for interest in marine science. He also discusses the areas within marine biology which should be studied and seeks to discourage one shot field trips as not being adequate to accomplish the task at hand.

449. Heffner, R. L. Phytoplankton dynamics in the Delaware River estuary. Unpublished masters degree thesis, Millersville, Pa., 1971. (Methods)

*450. Heinkel, O. A. & Tepedino, F. J. An assessment of the marine industry and marine technology programs in community colleges in San Diego County. Final project report. 1972 (ERIC Document Reproduction Service No. ED 081 420). (Careers) (High School)

This is needs assessment survey which measured the gap between marine technology education and the related market needs. The report indicates that at the time of writing, people were not being adequately trained.

*451. Heinzel, J. R. & May, R. V. A study of the rating structure requirements for the aviation 3M data analysists. 1969 (ERIC Document Reproduction Service No. ED 054 312). (Careers)

This was a study to determine the optimum means of identifying personnel qualified to perform analysis tasks.

*452. Heitzmann, W. R. Two if by sea: America's maritime heritage and the social studies teacher. 1975 (ERIC Document Reproduction Service No. ED 109 039). (Curricula)

The document includes units about fishing, naval technology, and other sea related topics. It also provides a rationale for providing students with a study of the sea.

*453. Heitzmann, W. R. America's forgotten maritime heritage: a bicentennial treasure. Social Education, 1975, 39 (6), 400-406. (Careers) (High School)

In this article, Heitzmann examines contributions of maritime enterprises to the development of America. These contributions are part of a social studies curriculum.

*454. Hellman, M. Sourcebook for oceans: our continuing frontier. Courses by newspaper. 1977 (ERIC Document Reproduction Service No. ED 138 505). (Methods) (High School)

The document is one of several used with a 16 week course about the oceans. The course was offered by San Diego University extension service through the newspaper.

*455. Helrich, J. Handbook of techniques and guides for the study of the San Francisco bay-delta-estuary complex, part 2. Key to the phytoplankton phyla and genera. 1971 (ERIC Document Reproduction Service No. ED 086 483). (Curricula) (High School)

The guide was designed to help teachers and students gather data about the San Francisco Bay area.

*456. Hemenway, L. Please pass the plankton. Wilson Library Bulletin, 1974, 49 (2), 165-172. (Bibliographies)

Hemenway presents a brief review of 72 books available in oceanography. She includes a brief description of each, as well as author, publisher, publication date, and applicable grade level. The article contains books which are good primarily in grades 1-9.

457. Henderson, B. C. Student enrollment in earth science, 1969-1970. Geotimes, 1970, 15 (10), 16-19. (History)

458. Henson, K. T. Representation of pertinent earth science principles in current science textbooks. School Science and Mathematics, 1970, 70 (7), 646-648. (Curricula)

*459. Herbich, J. G. Industries interest in ocean engineering education programs. 1971 (ERIC Document Reproduction Service No. ED 100 615). (Careers)

The results of a questionnaire showed that industry feels undergraduates should concentrate on basic sciences and humanities.

*460. Hermanni, E. & Ritchie, H. S. Movements of water. The Grade Teacher, 1940, 57, 5-11. (Oceanography) (Grades K-12)

This is a brief description of ocean currents and their causes. It includes an excellent collection of simple line drawings of currents.

461. Herron, R. R. Enrichment of the invertebrate study in the life sciences curriculum. Unpublished masters thesis, University of Utah, 1969. (Curricula)

*462. Hersey, J. B. Marine geophysics.1944 to 1966. Science Teacher, 1967, 34 (9), 15-20. (History)

The author discusses the history of marine geophysics investigation. He also provides some information concerning the history of instruments such as the magnetic compass.

463. Heyerdahl, T. How to kill an ocean current. Saturday Review, 1975, 3, 12-18. (Pollution)

*464. Hicks, S. C. Ocean tides. Science Teacher, 1965, 32 (9), 11-14. (Tides) (High School)

This article discusses the causes of tides, variations in the tides, observed tidepredictions, and the engineering applications of tide predictions.

*465. Higher Education International Conference on oceanography. Higher Education, 1960, 17 (1), 17-18. (Reports)

This is a description of a UNESCO sponsored international conference on oceanography.

*466. Hill, B. H. Marine option program, First biennial report. 1973 (ERIC Document Reproduction Service No. ED 093 665). (Careers)

This is a description of the marine studies program at the University of Hawaii for the period March 1, 1972 through August 31, 1973.

*467. Hill, P. G. Directory of facilities. Developmental activities in the marine environment of the coastal plains. 1971 (ERIC Document Reproduction Service No. ED 054 930). (Careers)

Hill describes the marine facilities in North and South Carolina and Georgia.

468. Hill, W. & White, R. New horizons for environmental education. Journal of Environmental Education, Winter 1969, 1 (2), 43-46. (Curricula)

*469. Hoagey, C. At the sea shore. Instructor, 1963, 72 (10), 24. (Music) (Grades K-6)

This is an article which is essentially a collection of songs of the sea.

*470. Hodges, E. F. Sand and sea. The Grade Teacher, 1954, 71 (10), 24-25. (Beaches) (Grades K-12)

This is a story of sand, how it is made, where it is found, and why there are different kinds.

*471. Hodgins, H. R. On an oceanographic expedition off Cape Hatteras. Instructor, 1970, 79 (5), 67. (Methods)

The need for marine science in the public schools is discussed herein.

*472. Hogg, T. C. et al. Man in the marine environment. 1971 (ERIC Document Reproduction Service No. ED 056 884). (Careers)

The marine program for the period July 1970-June 1971, at Oregon State University is discussed here. The major components of the program included research seminars, speakers, and considers man's attitude toward the environment.

*473. Hollenbeck, I. A unit on marine biology. American Biology Teacher, 1954, 16 (1), 5-7. (Methods) (High School)

The methods by which a high school marine biology unit is taught at Salem, Oregon are discussed herein. The information includes methods by which field trips are conducted as well as a consideration of the needs and desires of the students.

474. Holt, D. J. Some observations on the purple-clawed hermit crab. Unpublished masters thesis, Millersville State College, 1971. (Methods)

*475. Hon, W. Rowboat oceanography. Science Teacher, 1971, 38 (1), 27-30. (Methods)

The article contains some excellent descriptions of marine sampling methods. One such method is the use of a transect and a quadrat within a transect.

*476. Hon, W. The regional marine science project of the Carteret County, North Carolina public schools. Experiments in the use of field ecology as an approach to understanding coastal environment. 1969 (ERIC Document Reproduction Service No. ED 055 833). (Curricula) (Grades K-12)

The program was developed with the aid of Title III funds from ESEA. It involves courses which span the K-12 continuum, is oriented toward field ecology, makes use of field trips, and sets up discovery situations for problem solving.

*477. Hood, E. Lummis seek spirit of the salmon. Manpower, 1971, 3 (9), 2-7. (Careers)

The author describes how the northwest indians have turned to aquaculture as a source of jobs and a steady income.

*478. Hoover, L. Geotimes news of the earth sciences. 1968 (ERIC Document Reproduction Service No. ED 019 247). (Curricula)

The need for change in the geology curricula is discussed here. The author also discusses similar curricula in France, Germany, England, and the United States. Geotimes is available from American Geological Institute, 1444 N Street N. W., Washington, D. C. 20005.

*479. Hope, R. Living well after fifty: a seafarer prepares to retire. Adult Education (London), 1973, 45 (5), 293-296. (Careers)

The author suggests that, when the sailor reaches his mid-forties, might be a good time to study a pre-pre-retirement course.

*480. Hope, R. In cabined ships at sea; fifty years of the seafarers education service. 1969 (ERIC Document Reproduction Service No. ED 044 605). (Methods)

The article describes 50 years of this services activities. It includes courses offered, methods of materials distribution, information concerning correspondence with tutors, films, completion certificates, etc. It is available from George G. Harrap & Co., Ltd., 182 High Holborn, London WC1, England.

481. Hope, R. Adult education at sea. Adult Education (London), 1969, 42 (3), 143-147. (Methods) (High School)

*482. Hopman, A. B. Helping children learn science, a selection of articles reprinted from science and children. 1966 (ERIC Document Reproduction Service No. ED 017 468). (Curricula)

Some of the inclusive articles contain marine related classroom activities.

*483. Howard, A. S. The greatest traveling library in the world. Journal of Adult Education, 1932, 4, 401-403. (Methods)

Howard describes the American Merchant Marine Library Association, its foundation in 1921, and the first gift of books by the Association. The Association started serving ships and off-shore lights of the Coast Guard in 1926.

*484. Howe, M. Student syllabus. Santa Ana, California: Orange County Department of Education, 1978. (Curricula)

This handbook of oceanography includes Orange County Marine Science Laboratory Programs, as well as instructions for the operation of equipment aboard the floating laboratory.

485. Howe, N. R. & Sheikh, Y. M. Anthopleurine: a sea anemonie alarm pheromone. Science, 1975, 189, 386-388. (Macroorganisms)

486. Hoyle, W. E. On a deep tow-net for opening and shutting under water. Proc. Liverpool Biol. Soc., 1899, 3, 100-112. (Methods)

*487. Hull, E. W. The atom and the ocean, understanding the atom series. 1968 (ERIC Document Reproduction Service No. ED 042 651). (Careers)

The role of atomic physics in ocean exploration are discussed here. The methods of atomic physics are used to analyze plankton for levels of man made radiation.

*488. Hummer, P. Fish ponds-sources of organisms for the laboratory. Science Education, 1974, 41 (5), 55-57. (Methods)

Long handled, fine mesh nets are used to collect microinvertebrates, snails and other organisms. The methods used by the author could easily be applied to a tide pool situation.

*489. Hunt, E. D. Sammy salmon. Instructor, 1953, 62 (7), 45. (Fish) (Grades K-8)

The author describes the salmon's return from the sea to its home stream for the purpose of spawning.

490. Hyland, W. Life between the tides. Sea World, Winter 1977-78, 17-19. (Oceanography) (High School)

*491. IGY Committee. Earth-probe analysis. The Science Teacher, 1958, 25 (8), 434-437. (Oceanography) (High School)

The author discusses some of the accomplishments made by nations participating in the IGY.

492. Ingmanson, D. E. Using the near shore marine environment as a field laboratory. Unpublished doctoral dissertation, Florida State University, 1967. (Methods)

493. Instructor. Space and oceanography bibliography. Instructor, 1970, 79 (5), 68. (Bibliographies)

*494. Instructor. The ocean and today's world. Instructor, 1970, 79 (5), 59-63. (Methods) (Grades K-8)

The author discusses methods of teaching oceanography to elementary school students herein.

*495. International Field Studies, Inc. International field studies 1973 to the Bahamian government. 1973 (ERIC Document Reproduction Services No. ED 086 510). (Methods)

This is a description of the international field studies program on Andros Island, Bahamas.

496. Isaacs, J. D. & Schwartzlose, R. A. Active animals of the deep sea floor. Scientific American, 1975, 233, 84-91. (Macroorganisms) (High School)

497. Isbell, T. T. Brazosport sets a course for ocean and marine technology. Technical Education, 1972, 87. (Curricula)

498. Jackson, D. D. Dolphin catch-catch 72: slaughter of porpoise by the U. S. tuna fleet. Sports Illustrated, 1976, 44, 59-60. (Dolphins)

499. Jackson, L. J. Survey of benthie deposits from Newark Bay for oil content. Unpublished masters thesis, Glassboro State College, 1972. (Methods) (High School)

*500. Jacobson, D. Operation quick find, Science Activities, 1972, 7 (3), 13-15. (Careers) (High School)

Jacobson describes the use of a trained sea lion to locate and attach a retrieval device to submerged instruments and test equipment.

*501. Jahoda, W. J. Our teacher, the sea. Instructor, 1963, 72 (10), 22-23. (Methods) (Grade K-6)

This is a photographic series of children investigating the sea shore.

*502. Janke, D. L. & Pella, M. O. Earth science concept list for grades K-12 curriculum construction and evaluation. Journal of Research in Science Teaching, 1972, 9 (3), 223-230. (Curricula) (Grades K-12)

The article presents a list of 52 earth science concepts in order of their ranking by a panel of earth scientists who were asked to judge the importance of the concepts for inclusion in the school curriculua.

*503. Jennings, F. D. The challenge of inner space. The Science Teacher, 1961, 28, 6-12. (Careers)

The article discusses some of the marine science activities of the National Academy of Sciences.

504. Jensen, A. C. Cousin to man. Conservationist, 1976, 30, 30-34. (Dolphins)

505. Jensen, A. C. & Foehrenbach, J. Testing for mercury in New York's marine fish and shellfish. Conservationist, 1971, 26 (12), 31-33. (Pollution)

*506. Jensen, B. L. Technicians fight river inlet pollution. Technical Education Reporter, 1974, 1 (2), 15-20. (Careers)

This document describes the development of an estuarian resource technician program. The program curriculum student placement and student recruitment are also discussed.

*507. Jensen, D. The hagfish. Scientific American, 1966, 214 (2), 82-90. (Fish)

The author treats in great detail, the anatomy and physiology of the hagfish.

*508. Johnson, D. W. & Skutch, A. H. Littoral vegetation on a headland of Mt. Desert Island, Maine I. Submersible or strickly littoral vegetation. Ecology, 1928, 9, 188-215. (Methods) (High School)

The authors provide the reader with many good methods of studying intertidal vegetation.

*509. Johnson, D. S. & Alexander, F. S. Littoral vegetation on a headland of Mt. Desert Island, Maine II. Tide-pools and the environment and classification of submersible plant communities. Ecology, 1928, 9, 307-338. (Methods) (High School)

Excellent methods for studying intertidal vegetation are presented herein.

510. Johnson, M. A tidepool guide to animals of Southern California. Santa Ana, California, Orange County Department of Education. 1977. (Keys)

511. Johnson, M. C. Economic development of the ocean, some perspectives. Marine Technology Society, 1969, 3 (2), 67-70. (Careers)

*512. Johnstone, E. J. Sally, the sea anemone. Instructor, 1957, 66 (6), 44. (Macroorganisms) (Grades K-6)

This is a discussion of the sea anemone and other organisms to which it is related.

*513. Jones, M. Marine engine mechanics. Performance objectives. Basic course 1. 1977 (ERIC Document Reproduction Service No. ED 139-961). (Curricula) (High School)

This course was developed at Duval County School Board, Jacksonville, Florida. It is a 360 hour course which includes instruction and practical experience with both two and four cycle marine engines.

*514. Jones, M. Marine engine mechanic. Performance objectives. Intermediate course. 1977 (ERIC Document Reproduction Service No. ED 139 960). (Curricula) (High School)

This is a 540 hour intermediate course dealing with marine engine repair. It deals with troubleshooting techniques on outboard and inboard-outboard, and inboard marine engines.

515. Jordan, A. M. Porpoises and purse seiners; dolphins killed when fishing for tuna. Oceans, 1974, 7, 6-7. (Dolphins)

*516. Kane, M. M. An algae-outside purification system for marine aquaria. American Biology Teacher, 1974, 36 (6), 344-345. (Aquaria)

This system can be built at a minimum cost and was designed to rid aquaria of contaminants such as urea, ammonia and other toxic organic waste products. The system filters convert the toxic wastes to nitrates by bacterial action.

517. Kanzler, C. C. Marine algae of southwestern Connecticut. Unpublished masters thesis, Eastern Connecticut State College, 1972. (Methods)

518. Kaplan, E. H. A survey of marine laboratories with facilities for teaching tropical marine biology. Sea World, 1977-78, Winter, 42-44. (Curricula)

519. Kasindorf, M. Sports; watching the California gray whale migration. Newsweek, 1976, 87, 6. (Whales)

520. Kausch, A. R. A unit on marine plankton: a survey of the inclusion of marine planktonology in biology courses of 22 public high schools, Bergen County, New Jersey. Unpublished masters thesis, Montclair State College, 1965. (Curricula)

521. Kavanaugh, D. A study of the molting cycle of the common hermit crab, pagurus longicarpus. Unpublished masters thesis, Southern Connecticut State College, 1967. (Methods)

522. Kearns, E. The effects of a thermal plume on population of finfish and crustaceans in Barnegat Bay. Unpublished masters thesis, Jersey City State College, 1975. (Methods)

*523. Keeling, C. D. Marine technicians handbook, instructions for taking air samples on board ship: carbon dioxide project. 1971 (ERIC Document Reproduction Service No. ED 065 316). (Methods)

The document provides specific instructions for taking samples at sea.

524. Keith, H. D. Simplified theory of ships waves. American Journal of Physics, 1957, 25, 466-474, (Waves) (High School)

*525. Kellog-Smith, O. Biological oceanography, junior grade. Bioscience, 1968, 18 (10), 975-976. (Curricula)

This is a discussion of a program conducted at several levels. Research indicates that reception for the program was warm.

*526. Kester, D. Chemical processes in the ocean. Journal of Chemical Education, 1972, 49 (2), 11-14. (Oceanography)

Kester considers some aspects of the composition and physical chemistry of sea water and the processes affecting oxygen in the ocean.

*527. Key, R. E. A science teacher's handbook to Guam. 1968 (ERIC Document Reproduction Service No. ED 030 564). (Curricula)

The publication describes the environment of Guam including the marine environment. It also provides sources of materials and is available from Guam Science Teachers Association, P. O. Box 2872, Agana, Guam 96910.

528. Kilfoyle, S. The aquarium. Universi y of Maine, Orono, Maine, the Northern New England Marine Education Project, 1978. (Aquaria) (Grade 2)

529. Kilfoyle, S. & Picker, L. Finestkind. University of Maine, Orono, Maine, the Northern New England Marine Education Project, 1978. (Oceanography) (Grade 4)

530. Killey, K. December's child: Tasmanian fur seals. International Wildlife, 1974, 4, 18-19. (Seals)

531. Klemm, E. B. A plan for marine education in Hawaii. The Journal of Marine Education, 1976, Summer, 3-5. (Curricula)

*532. Klugh, B. A. Factors controlling the biota of tidepools. Ecology, 1924, 5, 192-196. (Methods)

Some of the factors which control tidal pool biota are salinity, sunlight, temperature.

*533. Knauss, J. A. Marine science and the 1974 law of the sea conference. Science, 1974, 184 (4144), 1335-1341. (Law)

This is a review of the status of the law of the sea negotiations as of 1974. The author discusses the 200 mile limit, mineral resources beyond the 200 mile limit, coastal state concerns, etc.

534. Knauss, J. A. The sea grant program at URI. Maritimes, 1968, 12, 1-2. (Reports)

*535. Knight, W. J. The union way to better seamanship. Panorama, 1971, 47, 2-9. (Curricula) (High School)

Students involved in this program may obtain a high school diploma by passing a special form of equivilancy test.

536. Knudtson, P. M. Birth of a harbor seal. Natural History, 1974, 83, 30-37. (Seals)

537. Kofoid, C. A. On an improved form of self-closing water-bucket for plankton investigations. University of California Publication in Zoology, 1911, 8 (9), 349-352. (Methods)

538. Kofoid, C. A. On a self-closing plankton net for horizontal towing. University of California Publications in Zoology, 1911, 8 (8), 311-348. (Methods)

539. Kofoid, C. A. A self-closing water bucket for plankton investigation. Cons. Perm. Expl. de la Mer. Publ. de Cire., 1906, 32, 1-10. (Methods)

*540. Kogawa, Y. The living seaside. Instructor, 1956, 65 (10), 86. (Methods)

The author describes a method of uniting art and science at the seashore.

541. Kooyman, G. L. et al. Spout of the gray whale: its physical characteristics. Science, 1975, 190, 908-910. (Whales)

542. Kooyman, G. L. Deep divers of the Antarctic; emperor penguins and weddell seals. Natural History, 1968, 85, 36-45. (Seals)

*543. Kopec, R. J. Global climate change and the impact of a maximum sea level on coastal settlement. The Journal of Geography, 1971, 70, 541-549. (Pollution) (High School)

This is a discussion of pollution in relationship to temperature change.

*544. Kraft, T. L. Can education and this nation survive? American oceanography. 1970 (ERIC Document Reproduction Service No. ED 050 990). (Curricula)

Nine marine science programs for students of various levels are discussed herein. The author includes program objectives and procedures.

*545. Kraft, T. L. & Miloy, L. Let's talk about you and sharks, American oceanography special educational newsletter, 1971 (ERIC Document Reproduction Service No. ED 052 048). (Oceanography) (Grades 8-12)

This is a collection of articles oriented primarily to the habits of sharks, jelly fish, and rays. It also includes some pollution related articles.

*546. Krupowicz, J. R. Studying the ocean frontier. The Science Teacher, 1969, 36 (3), 39-40. (Curricula) (High School)

A marine program is offered at Middletown High School, Rhode Island for non-college bound students. The article includes source of information and field trip locations.

547. Ku, T. L. et al. Eustatic sea level 120,000 years ago on Oahu, Hawaii. Science, 1974, 183, 959-962. (History) (High School)

*548. Kuenslter, I. D. Tubby, the baby sea elephant. American Childhood, 1946, 32 (1), 55. (Seals) (Grades K-6)

This discussion of seals and some of their habits, for example how they sleep in the sun, is well suited for grades K-6.

*549. Kuhn, D. J. Experiments with display patterns in the siamese fighting fish. American Biology Teacher, 1970, 32 (2), 102-104. (Fish) (High School)

The author uses this species of fish to study fish behavior.

*550. Kyoo, C. K. C. Tidelands biology research in a Korean high school. American Biology Teacher, 1970, 32 (2), 93-95. (Methods) (High School)

In this program, Korean high school students investigate coastal fish species.

551. Lamie, R. G. A formal course in oceanography at the secondary level through independent study. Valhalla, New York, Valahalla Union Free School District, 1968. (Curricula) (High School)

*552. Lamie, R. G. A formal course in oceanography at the secondary level through independent study, summary report and final report. 1967 (ERIC Document Reproduction Service No. ED 016 619). (Curricula) (High School)

A study was made by Lamont Geological Institute and Woods Hole Oceanographic Institute to determine the feasibility of offering a course in oceanography at the secondary level. This document contains lecture materials and a bibliography.

*553. Lanier, J. A., et al. Aquaculture thesaurus: descriptors used in the national aquaculture information system. 1977 (ERIC Document Reproduction Service No. ED 143 498). (Methods)

The document provides a list of descriptors used in the National Aquaculture Information System. This is a retrieval system for computer stored information concerning marine brackish and fresh water organisms.

*554. Lau, A. W. An analysis of the navy vocational interest inventory as a predictor of career motivation. 1969 (ERIC Document Reproduction Service No. ED 054 318). (Careers)

This is a non-cognative inventory. The researchers found that occupational keys were more viable predictors in predicting reenlistment than area scales.

*555. Lau, A. W. Area scales of the navy vocational interest inventory as predictors of school performance and rating assignment. 1969 (ERIC Document Reproduction Service No. ED 054 319). (Careers)

This document describes the scales and the tests conducted to validate the scales.

556. Lavigne, D. M. Life or death for the harp seal. National Geographic, 1976, 149, 128-142. (Seals)

557. Leboeuf, B. J. Hectic life of the alpha bull elephant seal as fighter and lover. Psychology Today, 1974, 8, 104-105. (Seals)

558. Lethcoe, J. Hitch-hiker to remember. Yachting, 1975, 138, 39. (Seals)

*559. Levenson, D. The clearwater sails against pollution. Teacher, 1975, 92 (7), 66-67. (Pollution) (Grades K-8)

The program described herein, was designed to educate students about their environment so that they might help save it from destruction.

560. Levenspiel, O. & de Nevers, H. The osmotic pump. Science, 1974, 183 (4121), 157-160. (Methods)

*561. Lidstrom, E. The aquart room. Arts and Activities, 1975, 30-31. (Methods) (Grades K-8)

Lidstrom approaches the study of the world ocean through art.

562. Lilly, A. C. Rights of cetaceans under human laws. Oceans, 1976, 9, 66-68. (Law)

*563. Linnenbon, V. J. Our ocean planet. The Science Teacher, 1967, 34 (5), 25-26. (Careers)

This article presents scientific, historical, and career education. The author describes the physicists and the engineers view of the ocean.

*564. Linsky, R. B. Oceans and children: marine science and ecological understanding. Childhood Education, 1971, 47 (4), 191-194. (Curricula)

This program was developed with Title III funds from ESEA. In the program, teachers and children learn a reverence for life in a hands-on approach to the study of oceanography and marine ecology.

*565. Linsky, R. B. Educational strategies for an environmental ethic. The Science Teacher, 1971, 38 (1), 16-18. (Methods)

Linsky discusses the need for a hands-on program at Orange County, California.

566. Linski, R. B. Developing environmental awareness: a new approach to an old problem. Oceans, 1969, 1 (51), 52-58. (Oceanography)

*567. Linski, R. B. & Schnitger, R. L. Teachers guide. 1969 (ERIC Document Reproduction Service No. ED 046 684). (Curricula)

The guide was developed with the aid of funds from ESEA Title III funds. It provides copies of materials given to students who participate in the Orange County, California floating lab program. The guide also provides information concerning colleges and universities having ocean programs, bibliographies of films and pollution related articles and marine science articles appearing in Scientific American between 1948 and 1969.

*568. Linsky, R. B. & Schnitger, R. L. Marine science student syllabus, third edition. 1969 (ERIC Document Reproduction Service No. ED 039 146). (Curricula)

Developed with Title III funds of ESEA, this manual's prupose is to prepare students for Orange County California's floating lab program.

*569. Linsky, R. B. Proceedings of the marine sciences in education conference. 1968 (ERIC Document Reproduction Service No. ED 028 098). (Reports)

The conference was conducted by the Orange County Board of Education. It covered areas such as teaching methodology and curricula.

*570. Linsky, R. B. & Schnitger, R. L. Marine sciences student syllabus. 1968 (ERIC Document Reproduction Service No. ED 028 097). (Curricula)

The manual covers the chemical and biological properties of the oceans. The manual also includes pictorial taxonomie keys.

571. Linsky, R. B. A hands-on practice of science. Underwater Naturalist, 1968, 5 (3), 29-31. (Curricula)

*572. Linsky, R. B. Marine biology, a summer enrichment course. The Science Teacher, 1967, 34 (6), 40-41. (Curricula)

A six week summer program was offered to students of all educational levels who lived within the boundaries of the Fountain Valley, California school district. The program included lectures and field trips.

*573. Lissant, E. K. Construction of an algae culture chamber. American Biology Teacher, 1969, 31 (1), 27-28. (Methods)

The author describes a method of construction of such a chamber. The chamber was built to grow marine tropical algae.

*574. Lloyd, S. J. The world's greatest mine. Journal of Chemical Education, 1947, 24, 273-276. (Oceanography)

This is a discussion of the composition of sea water and the power which might be derived from the sea.

*575. Louisiana State University. Marine research interest in Louisiana universities. 1975 (ERIC Document Reproduction Service No. ED 113 202). (Careers)

The document identifies the marine research interests and capabilities of Louisiana's research community. It identifies 79 marine activity categories.

576. Lovmark, N. H. A survey of the marine community and the development and evaluation of a pilot program for the senior high school. Unpublished masters thesis, California State University, 1971. (Curricula)

*577. Luedtke, J. R. Directory of marine and marine-related information resources at the University of Wisconsin. 1970 (ERIC Document Reproduction Service No. ED 061 045). (Bibliographies)

This is a two volume directory of library and film resources for marine related information. The listings include periodicals, indexes, abstracts, bibliographies, monographs, films, and film strips.

*578. Luedtke, J. R. Directory of marine and marine related information resources at the University of Wisconsin, part I, references and referral resources. 1970 (ERIC Document Reproduction Service No. ED 061 044). (Bibliographies)

This document is volume one of a two volume set. The first volume is listed in the citation preceeding this one. This volume lists libraries, information centers, and selected marine research labs.

579. Lyman, J. Marine. Geotimes, 1973, 18 (1), 26. (Chemistry)

*580. Lyman, J. Marine geochemistry. The Science Teacher, 1967, 34 (5), 27-30. (Chemistry)

The marine geochemical cycle between the earth and atmosphere are discussed herein.

581. Lyman, J. & Abel, R. B. Chemical aspects of physical oceanography. Journal of Chemical Education, 1958, 35 (3), 113-115. (Chemistry)

*582. Lynch, D. L. & Fenwick, M. G. Factors affecting the growth of two green algae. American Biology Teacher, 1974, 36 (8), 494-495. (Methods)

The authors use different media to study the growth of two different species of algae. The method can be used to demonstrate the affect of environmental pressures upon populations.

*583. Mac Curdy, J. F. Teaching marine biology at the secondary level. American Biology Teacher, 1955, 17 (8), 251-253. (Curricula) (High School)

The author discusses a four unit marine science program which lasts six weeks. At the time of writing, the program had been in operation for five years. The program involves collecting nad identifying marine species, building marine aquaria, painting marine pictures, and giving oral reports.

*584. Mac Dermand, E. A springtime study of water life. Instructor, 1962, 71 (8), 44. (Methods) (Grades K-6)

This unit of instruction covers several academic areas. It was designed for fresh water areas but can also be used in marine areas.

585. Mac Donald, D. Phantoms of the polar pack ice: ivory gulls. Audubon, 1976, 78, 2-19. (Gulls)

586. Mac Lean, D. Annotated bibliography: oceanography for elementary classrooms. Santa Ana, California: Orange County Department of Education, 1977. (Bibliographies)

*587. Mac Lean, D. A. Curriculum. The Journal of Marine Education, 1976, Summer, 1-33-1-34. (Curricula)

The author deals with many aspects of the marine science curriculum.

*588. Mac Lean, D. S. Give them an earful where they work. Training in Business and Industry, 1971, 8 (1), 26-29. (Careers)

An effective shipboard training package for the Navy evolves through the use of systems analysis.

589. Macintyre, F. Top millimeter of the ocean. Scientific American, 1974, 230, 62-69. (Oceanography)

*590. Mackenzie, W. D. Seals and their adaptations. South Australian Science Teachers Journal, 1973, 734, 18-24. (Seals)

The author discusses seals in terms of their classification, ecological influences, their pelage, thermoregulation, respiratory and vascular systems, and their predators and mortality.

*591. Maclean, D. A. & Gessel, J. R. The ocean and today's world. Instructor, 1970, 79 (5), 59-64. (Curricula) (Grades K-8)

The author suggests many activities which are useful in grades K-8.

592. Malalesta, A. Back to the green kingdom. American Biology Teacher, 1955, 17 (3), 105-108. (Methods) (High School)

*593. Malec, V. M. & Lansville, A. Interm quantitative manpower projections for proposed hydrographic survey ship system (AGS) candidate configurations (navyships subproject 'S46-27012 task 14408). 1969 (ERIC Document Reproduction Service No. ED 054 311). (Careers)

This is a discussion of needs for survey ship systems.

594. Mallory, I. Edge of the winter sea. Travel, 1975, 144, 30-33. (Beaches)

595. Malloy, M. A survey of the opinions of the participants towards a marine biology institute held at Bowdin College, Brunswick, Maine, summer 1967. Unpublished masters thesis, Stetson University, 1967. (Curricula)

*596. Mangelsdorf, F. E. et al. Proceedings of the New England conference on ocean science education, Woods Hole, Mass. 1966 (ERIC Document Reproduction Service No. ED 028 943). (Curricula)

The conferees discussed the various aspects of marine science and marine science teacher education.

*597. Manpower Administration. Fish cutter (fish) 3-89.04 technical report on standardization of the general aptitude test battery. 1963 (ERIC Document Reproduction Service No. ED 065 610). (Careers)

This article presents a series of 12 tests, norms for each test, etc.

*598. Manpower Administration. Shrimp picker (can & preserve) 8-04.10 technical report on standardization of general aptitude test battery. 1963 (ERIC Document Reproduction Service No. ED 065 611). (Careers)

The document discusses a series of 12 tests and occupational norms.

599. Manzi, J. J. The effect of temperature and salinity on the feeding, reproduction, and survival rates of the marine gastropods. Unpublished masters thesis, Southern Connecticut State College, 1969. (Mollusca)

600. Marcus, B. A. A model for demonstrating algae blooms in artifical reservoirs. American Biology Teacher, 1974, 36 (9), 558-560. (Methods)

*601. Marine Fisheries Review. Oceanic education gets NOAA support. Marine Fisheries Review, 1977, 39 (12), 28. (Curricula)

The article describes two marine education projects which were funded by NOAA. One program is to be conducted by the University of North Carolina, while the second is at the University of Maine. Both programs deal with teacher education and the U of M program (Northern New England Marine Education Project) also will develop a cross disciplinary curriculum package relevant to the Northern New England area.

*602. Marine Science Project. The major coastal communities of North Carolina. 1968 (ERIC Document Reproduction Service No. ED 020 829). (Curricula)

The program deals with five types of natural habitat in terms of plants, animals, and adaptations.

*603. Marshall, N. Oceanography, the new frontier for the twenty-first century. The Science Teacher, 1973, 40 (8), 16-19. (Careers)

This discussion of oceanography presents some of the specific areas of concern in oceanography. The author also comments upon the major resources of the oceans and reflects upon how these resources may be used and shared by nations of the world.

604. Martin, R. A. Reef life in the Bahamas. Oceans, 1975, 8, 44-53. (Oceanography)

*605. Martin County Schools. Environmental studies center teacher books. 8th grade--beach investigations. 1977 (ERIC Document Reproduction Service No. ED 142 435). (Curricula) (Grade 8)

This guide is one of nine teacher packages developed for use in a sequential, hands-on, field oriented, K-8 environmental education program. The activities in this collection relate to the interaction of beach processes such as longshore currents, waves, wave action, wind action, and dune formation.

*606. Martin County Schools. Environmental studies center teacher books. 7th grade--spoil island investigation. 1977 (ERIC Document Reproduction Service No. ED 142 434). (Curricula) (Grade 7)

This guide is one of a series of nine developed for use in the Martin County schools, Jensen Beach, Florida. The topics which are investigated include succession, soils testing, salinity, dissolved oxygen, and island water tables. The guide includes instructions, scripts, tests, answer keys, and copies of all student materials.

*607. Martin County Schools. Environmental studies center teacher books. 6th grade--river investigation. 1977 (ERIC Document Reproduction Service No. ED 142 433). (Curricula) (Grade 6)

The grade six program centers around a river investigation. It includes the use of a survey boat to investigate the river. The study includes changes in salinity, and other factors affecting the estuarian ecosystem.

*608. Martin County Schools. Environmental studies center teacher books. 5th grade--ecosystems. 1977 (ERIC Document Reproduction Service No. ED 142 432). (Curricula) (Grade 5)

The fifth grade program at Jensen Beach, Florida centers around the theme of ecosystems. In this program, the concepts of food and energy webs are used to illustrate the interraction of all organisms within the various communities of an estuarine ecosystem.

*609. Martin County Schools. Environmental studies center teacher books. 4th grade--mangrove communities. 1977 (ERIC Document Reproduction Service No. ED 142 431). (Curricula) (Grade 4)

The fourth grade environmental science program at Jensen Beach centers around mangrove communities. It includes fact finding about mangroves, data collection and interpretation, and food chain construction.

*610. Martin County Schools. Environmental studies center teacher books. 3rd grade--grassflat communities. 1977 (ERIC Document Reproduction Service No. ED 142-430). (Curricula) (Grade 3)

The grade program centers around the concept of saltwater grassflat communities. Students in this program collect and interpret data about this type of community.

*611. Martin County Schools. Environmental studies center teacher books. 2nd grade--communities. 1977 (ERIC Document Reproduction Service No. ED 142-429). (Curricula) (Grade 2)

This program centers around communities and was designed to stimulate students' use of all of their senses in discovering more about their surroundings.

*612. Martin County Schools. Environmental studies center teacher books. 1st grade-- habitats. 1977 (ERIC Document Reproduction Service No. ED 142-428). (Curricula) (Grade 1)

The grade 1 program centers around the concept of habitats. It includes units on living vs. non-living things and animals that live in saltwater grassflats.

*613. Martin County Schools. Environmental studies center teacher books. Kindergarten--your environment. 1977 (ERIC Document Reproduction Service No. ED 142 427). (Curricula) (Kindergarten)

The kindergarten program includes a variety of activities designed to aquaint the students with the term environment.

*614. Mary, C. B. Adventures in ecological reading, language arts (experimental). 1974 (ERIC Document Reproduction Service No. ED 086 529). (Reading)

This reading program is used in Dade County, Florida public schools. It approaches reading from a marine point of view. The program includes textual readings, individual projects, and experiments.

*615. Mason, D. D. The world in a pool. Instructor, 1950, 59 (8), 28. (Macroorganisms) (Grades K-8)

This is a nontechnical description of animal life between the intertidal zone.

*616. Masters, C. O. Requirements for the culturing of sea animals. American Biology Teacher, 1967, 29 (7), 537-540. (Methods)

The author discusses aquaria, and marine animal behavior with respect to environmental organic content.

*617. Mathis, P. M. The effect of sulfur dioxide on lichens: a field activity. American Biology Teacher, 1974, 36 (7), 418-419. (Methods)

Sulfur dioxide content in the air effects the frowth rate and species composition of lichens in an area. These lichens may be marine.

*618. Matthews, W. H. Selected references for earth science courses. 1964 (ERIC Document Reproduction Service No. ED 019 219). (Bibliographies)

The document lists texts, teachers guides, and field activities.

*619. Matthews, W. H. Sources of earth science information. 1964 (ERIC Document Reproduction Service No. ED 014 426). (Bibliographies)

The document lists U. S. and Canadian sources of earth science information.

620. Mays, V. Creeping crinoids. International Wildlife, 1975, 5, 50-55. (Macroorganisms)

*621. Mazzone, W. F. Steps in man's return to the sea. The Science Teacher, 1966, 33 (8), 21-23. (Careers)

Mazzone presents a discussion of the Navy's Sealab II, some of its problsme, and some of the diving it has done.

622. Mc Carthy, J. Ups and downs of deep scattering layers in oceans. Smithsonian, 1976, 7, 72-79. (Oceanography)

623. Mc Clane, A. L. Shedding light on shad. Field and Stream, 1976, 80, 162-163. (Fish)

624. Mc Collam, J. Winds blow and waves grow. Motor Boating and Sailing, 1976, 137, 20. (Waves)

625. Mc Dermott, J. Five universities cooperate on a new look for marine biology. Canadian University and College, 1972, 7 (5), 18-19. (Careers)

*626. Mc Dermott, M. M. Navy career education diffusion project: state of Oregon. Final report. 1976 (ERIC Document Reproduction Service No. ED 120 484). (Careers) (High School)

The project was charged with research and development of navy occupational information for inclusion in the Oregon Career Information System.

*627. Mc Donald, H. A fishing unit. The Grade Teacher, 1953, 70 (10), 18-19. (Fish)

This unit on marine fishes was developed for use in coastal North Carolina.

*628. Mc Dougal, C. UN and the sea. UNITAR news, vol. 6 no. 1. 1975 (ERIC Document Reproduction Service No. ED 104 662). (Curricula)

Mc Dougal lists sample activities in the following areas: ocean pollution, oceanography, meterology, navigation, overflight, and training and technical assistance.

629. Mc Elroy, W. D. & Seliger, H. H. Biological luminescence. Scientific American, 1962, offprint no. 141. (Oceanography) (High School)

630. Mc Fadden, D. L. Teaching in tidepools. Oceans, 1973, 6 (5), 44-49. (Methods)

631. Mc Ginnis, R. F. Counterclockwise circulation in the Pacific subantarctic sector of the southern ocean. Science, 1974, 186, 736-738. (Oceanography)

*632. Mc Kinnerney, B. & Clark, D. L. Marine occupations in the Texas coastal zone. 1973 (ERIC Document Reproduction Service No. ED 080 798). (Careers)

This publication was designed for use by guidance counselors and curriculum developers.

*633. Mc Leod, F. & Mc Leod, E. Fathom one: marine science training center. Fathom two: lodgings for community students. Investigations of the requirements for two types of specialized community college. 1970 (ERIC Document Reproduction Service No. 049 549). (Curricula)

The Mc Leods discuss the needs in putting together a marine science institution on a community college basis.

634. Mc Loda, W. S. Transform fault model of sea-floor spreading. Journal of Geological Education, 1969, 17 (4), 151-152. (Oceanography) (High School)

635. Mc Vay, S. The last of the great whales. Scientific American, 1966, 215 (2), 13-21. (Whales) (High School)

*636. Mecca, C. E. Directory of personnel in research, technology, education, administration, and management. Development activities in the marine environment of the coastal plains region. 1970 (ERIC Document Reproduction Service No. ED 054 931). (Bibliographies)

The document concentrates on technical field personnel.

637. Melley, K. F. Oceanography in a ninth grade earth science course. Unpublished masters thesis, Central Connecticut State College, 1965. (Curricula)

638. Melvin, A. G. Mussels. Hobbies, 1976, 81, 128. (Macroorganisms)

*639. Menard, H. W. & Scheiber, J. L. Oceans: our continuing frontier. A courses by newspaper reader. 1977 (ERIC Document Reproduction Service No. ED 138 506). (Curricula)

The document is available from Publishers, Inc., 243 12th Street, Drawre P, Del Mar, California 92104. This reader is one of several supplementary materials for a 16 week newspaper course about oceans. The course covered the marine world from a cross disciplinary perspective.

*640. Mendoza, E. Storm location at sea--an illustration of group velocity. American Journal of Physics, 1954, 22, 208-211. (Oceanography)

The wavelength of an arriving wave train as a function of time can be used to determine the distance the observer is away from a storm center.

*641. Messick, M. K. How boffo grew up. American Childhood, 1944, 20 (3), 56. (Seals) (Grades K-6)

The author discusses many aspects of the seal's life. For example, the discussion includes a consideration of the mother's treatment of her young.

642. Miller, J. Barbados and the island-mass effect. Sea Frontiers, 1975, 21, 268-272. (Oceanography)

*643. Miller, J. W. & Mazur, J. E. Gallon-jar marine aquaria. American Biology Teacher, 1974, 36, 40-41. (Aquaria)

This simple method can be used inexpensively in most classrooms to maintain viable aquaria.

*644. Miller, J. S. Concerning the sand at the seashore. School Science and Mathematics, 1956, 56 (492), 321. (Beaches)

This article concerns wet, dry, and submerged sand and the forces which hold sand together.

*645. Minemier, B. The ocean world of Jacques Cousteau. Instructor, 1975, 84 (7), 125. (Bibliographies)

This is a review of the 20 volume set, The Ocean World of Jacques Cousteau. The primary thrust of this set of books is pollution and the biological aspects of the marine environment.

*646. Mitchell, L. G. J. Marine technician training and employment: a current overview and assessment summary. 1974 (ERIC Document Reproduction Service No. ED 113 179). (Careers)

This publication was designed as a guide for future program management it includes types of jobs available in the marine field as of the date of publication, marine oriented training programs, and a sample marine curriculum.

647. Modern Schools. Fish and seafoods lend variety to the sandwich theme. Modern Schools, 1970, 6-7. (Food)

648. Modern Schools. One-two-three--fish facts add up to school lunch benefits! Modern Schools, 1970, 3-5. (Food)

*649. Monahan, E. C. et al. Oceanography field practicum spring half-term. 1972 (ERIC Document Reproduction Service No. ED 094 955). (Careers)

The author describes a course which was conducted at the University of Michigan. The primary thrust of the course covered earth science as it relates to the oceans.

*650. Montgomery County Public Schools. Development of a pilot career cluster curriculum for all students in a college preparatory oriented high school. Final report. Part I: curriculum development. 1973 (ERIC Document Reproduction Service No. ED 084 377). (Curricula) (High School)

This is a career education program which uses mini-courses and internships.

651. Mooney, M. J. Tsunami warning systems. Sea Frontiers, 1975, 21, 227-235. (Waves)

652. Mooney, M. J. Tsunami coming. Oceans, 1975, 8, 26-33. (Waves)

653. Mooney, M. M. Discovery of the sea. Harpers Magazine, 1974, 249 97-99. (Oceanography)

654. Morelli, A. J. Navigational instruments and their development. Unpublished masters thesis, Boston State Teachers College, 1953. (History)

655. Moriary, T. E. Oceanography in the elementary school. Maritimes, 1967, 11, 13-14. (Curricula) (Grades K-8)

*656. Morgan, D. W. A handbook of estuarian life. American Biology Teacher, 1972, 34 (9), 538-539. (Methods)

This teachers manual on salt water studies includes information about salt water aquaria, as wll as lab and field activities.

*657. Morgan, M. J. A bibliography of elementary and secondary marine science curriculum projects and education materials. 1974 (ERIC Document Reproduction Service No. ED 089 995). (Bibliographies)

Morgan originally published this document as University of Rhode Island Marine Bulletin No. 15 and is available from the National Technical Information Service. The author reviewed marine science curricula and other educational materials.

*658. Morgan, W. Farming the sea. Agricultural Education Magazine, 1971, 43 (1), 272-273. (Careers)

The article describes a vocational education program in Florida to teach cultivation, harvesting, marketing, and conservation practices related to the production of oysters, shrimp, scallops, crabs and fun fishes.

659. Morin, J. G. et al. Light for all reasons: versatality in the behavioral repretoire of the flaslight fish. Science, 1976, 190, 74-76. (Fish)

660. Morton, S. D. & Lee, F. G. Calcium carbonate equilibria in the oceans--ion pair formation. Journal of Chemical Education, 1968, 45 (6), 513-515. (Chemistry)

*661. Mosaic. The academic fleet. Mosaic, 1975, 6 (4), 30-33. (Careers)

The article describes a fleet of ships which provide a base for lab space and equipment shared by many scientists studying the composition and behavior of the sea and its boundaries.

*662. Mosaic. All that unplowed sea. Mosaic, 1975, 6 (3), 22-27. (Careers)

The quantity of hunting currently being done at sea may be causing the sea to approach its productive limits. The author feels that aquaculture farming and conservation represent the sea's real promise.

*663. Mostert, N. Supership. New York: Warner Books, Inc., 1976. (Careers)

Mostert describes the operations of the world's VhCC's and ULCC's. He also describes the crews' lives on these classes of ships.

664. Motor Boating and Sailing. Chapman's update: excerpts from piloting, seamanship and small boat handling. Motor Boating and Sailing, 1976, 137, 64. (Careers)

665. Motz, L. Destruction of the earth-moon system: excerpt from the universe. Natural History, 1976, 85, 80-83. (Tides)

*666. Moulton, J. M. An experiment in the behavior of intertidal animals. American Biology Teacher, 1968, 30, 105. (Methods) (High School)

The movements of intertidal organisms may be plotted by putting paint spots on the organisms and then watching them over time.

*667. Moutvic, J. C. Pickle jar oceanography. The Science Teacher, 1973, 40, 43. (Aquaria)

Low cost aquaria can be built for the average classroom by using pickle jars from the school cafeteria. One air pump can support as many as twelve of these aquaria. The author also discusses methods by which the aquaria can be used by students to study the marine world.

*668. Moutvic, J. C. Oceanography in the high school. The Science Teacher, 1967, 34 (5), 55-57. (Curricula) (High School)

The author describes activities which should be included in an oceanography program for any school within 100 miles of a lake or the ocean.

669. Moxtey, F. M. An analysis of heavy minerals in sediments of Delaware Bay. Unpublished masters thesis, Millersville State College, 1971. (Methods)

670. Mueller, L. Physiological adaptations of piokilotherms to the antarctic marine environment. Unpublished masters thesis, Northeastern Illinois University, 1971. (Methods)

671. Munch, T. W. Earth science and oceanography. Instructor, 1964, 74 (1), 65. (Oceanography) (Grades K-8)

*672. Murphy, J. E. Seaweeds are much more than weeds. Science Activities, 1974, 11 (3), 11-13. (Methods)

The author presents methods of studying seaweeds in the classroom.

*673. Murphy, J. E. Sex, symmetry and sea urchins. Science Activities, 1973, 9 (3), 21-23. (Methods)

When a .5M solution is injected into sea urchins they will extrude their eggs and sperm. Fertilization can then be observed through a microscope.

674. Murphy, J. E. The biological dredge. Science Activities, 1972, 7 (3), 22-24. (Methods)

675. Murphy, R. C. On poetry and education. The Journal of Marine Education, 1976, Summer, 28-29. (English) (Grades 7-12)

676. Murphy, R. C. Critters, the remarkable grunion. Sea World, 1977, Fall, 16-17. (Fish) (Grades K-12)

677. Murphy, R. C. The oceanic life of the antarctic. Scientific American, 1962, offprint no. 864. (Oceanography)

*678. Napoli, J. J. Marine programs at the University of Rhode Island. 1972 (ERIC Document Reproduction Service No. ED 094 940). (Careers)

The article describes URI's committment in all departments to a total marine program.

*679. Naquin, N. Marine and wetlands study. The Science Teacher, 1975, 42 (2), 41. (Methods)

Students involved in this program took a 3 day field trip to islands near Higgins High School, Jefferson Parish, Louisiana to study the marine environment.

*680. National Academy of Sciences. Toward an improved U. S. merchant marine: a recommended program of studies. 1977 (ERIC Document Reproduction Service No. ED 128 191). (Careers)

This document describes the development and current status of the U. S. Merchant Marine. It describes a wide spectrum of maritime activities, including the roles of various givernment agencies, the organization and effectiveness of U. S. Merchant Marine management, the structure and impact of labor-management relations, and the reaction of current and potential users.

*681. National Audiovisual Center. U. S. government films, 1969. A catalog of motion pictures and filmstrips for sale by the national audiovisual center. 1969 (ERIC Document Reproduction Service No. ED 033 612). (Bibliographies)

This is an annotated list of 3,000 films which document operations of federal agencies. Some of these films are in the marine areas.

*682. National Council on Marine Resources and Engineering Development. Marine science affairs--selecting priority programs. 1970 (ERIC Document Reproduction Service No. ED 045 440). (Careers) (High School)

This document describes the 1969 federal ocean programs, its policies, priorities and goals.

*683. National Council on Marine Resources and Engineering Development. University curricula in the marine sciences and related fields, academic years 1969-70 and 1970-71. 1969 (ERIC Document Reproduction Service No. ED 041 745). (Careers) (High School)

Marine degrees and curricula are listed here by institution.

*684. National Oceanic and Atmospheric Administration. User's guide to OASIS oceanic and atmospheric scientific information system. Key to oceanic and atmospheric information sources No. 1. 1975 (ERIC Document Reproduction Service No. ED 095 932). (Bibliographies)

This is an information retreival service that furnishes ready references to the technical literature and research efforts concerning the environmental sciences and marine coastal resources.

*685. National Oceanic and Atmospheric Administration. University curricula in the marine sciences and related fields, Academic years 1975-1976, 1976-1977. National Sea Grant Program, National Oceanic and Atmospheric Administration, 1976. (Careers)

This 225 page book is available free of charge from Director, National Sea Grant Program, National Oceanic and Atmospheric Administration, Department of Commerce, 3300 Whitehaven Street, N. W., Washington, D. C. 20235. The criterion for including an institution in this publication was that it be offering at least 25 semester hours in the marine field. It lists institutions alphabetically by name, and includes information on research vessels, research laboratories, degree programs, institutional faculty members, and entrance and course requirements.

*686. National Park Service. Elementary teachers resources manual, lightship Chesapeake. 1974 (ERIC Document Reproduction Service No. ED 086 501). (Curricula) (Grades K-8)

This guide was written to help teachers prepare students for a tour of the Lightship Chesapeake in Washington, D. C. It provides excellent information in the following areas: weather maps, humidity, food webs, air speed and direction, wind force scales, water analysis, and a host of others.

*687. National Society for Professional Engineers. Skills conversion project: chapter 10, ocean engineering and oceanography. 1972 (ERIC Document Reproduction Service No. ED 070 884). (Careers) (High School)

The society assessed the possibility of using displaced aerospace personnel in ocean engineering.

*688. Naval Education and Training Command. Engineering aid 1 & C, Rate training manual. 1971 (ERIC Document Reproduction Service No. ED 105 121). (Careers) (High School)

The publication prepares naval enlisted personnel for advancement.

*689. Naval Education and Training Command. Aviation boatswains mate E1 and C; rate training manual. 1974 (ERIC Document Reproduction Service No. ED 109 344). (Careers) (High School)

This is a guide for the preparation of naval enlisted personnel for advancement.

*690. Naval Education and Training Command. A navigation compendium. 1972 (ERIC Document Reproduction Service No. ED 096 098). (Methods) (High School)

The publication covers the basic terms, instruments, sources of information, currents, tides, physical laws, and trignometric functions related to navigation.

*691. Naval Education and Training Command. Machinists mate 1 and C; rate training manual. 1974 (ERIC Document Reproduction Service No. ED 106 658). (Careers) (High School)

This publication prepares naval enlisted personnel for advancement.

*692. Naval Education and Training Command. Introduction to sonar, naval education and training command. Revised edition. 1977 (ERIC Document Reproduction Service No. ED 129 585). (Careers) (High School)

This is a rate training manual and nonresident career course from a self-study package for naval personnel seeking to advance the sonar technician rating.

*693. Naval Education and Training Command. Quartermaster 3 & 2; rate training manual and nonresident career course. 1977 (ERIC Document Reproduction Service No. ED 132 263). (Careers) (High School)

This is a self study text which prepares naval enlisted personnel for advancement within the quartermaster rating.

*694. Naval Education and Training Command. Fireman: naval rate training manual and nonresident career course. 1977 (ERIC Document Reproduction Service No. ED 126 343). (Careers) (High School)

This nonresident career course was prepared to assist the fireman apprentice for preparation for advancement to fireman in the navy.

*695. Naval Intelligence Support Center. Russian-English glossary of international law terms (and selected terms in related disciplines). 1977 (ERIC Document Reproduction Service No. ED 139 265). (Bibliographies)

The glossary contains in excess of 750 terms encountered in international law texts.

*696. Naval Oceanographic Office. University curricula in the marine sciences and related fields, academic years 1971-72 and 1972-73. 1971 (ERIC Document Reproduction Service No. ED 063 861). (Careers) (High School)

The publication lists 134 institutions with marine science programs at the post secondary level. It includes admission requirements, programs, geographic locations of institutions, financial assistance information, etc.

*697. Naval Undersea Center. NUC symposium on environmental preservation, 20-21, May 1970. 1970 (ERIC Document Reproduction Service No. ED 088 691). (Oceanography) (High School)

Many topics are discussed herein. Some are: sea surface, oil slicks, the elephant seal, and sea lion mortality.

698. Navarra, J. G. The oceans of the world. Instructor, 1963, 73 (1), 36-37. (Curricula) (Grades K-8)

*699. Neal, V. T. Oceanography for teachers, a unique summer program. The Science Teacher, 1968, 35 (2), 38. (Methods)

Neal describes a summer program which started in 1968. Prior to this time there was no other summer program being offered for teachers. The areas the teachers found useful were: examples of visual aids, career education information, and information concerning the availability of low cost materials. The program was of a non-technical nature and covered the areas of biology, physics, geology, and chemical oceanography.

*700. Nealey, S. M. The relative importance of job factors: a new measurement approach. 1970 (ERIC Document Reproduction Service No. ED 045 721). (Careers) (High School)

A study was conducted using a sample of 91 navy men to ascertain how various job factors relate to retention in the navy.

701. Nelson, J. Oceanographic experiments for the elementary classroom. Santa Ana, California: Orange County Department of Education, 1977. (Methods)

*702. Nesbitt, W. A. & Karls, A. B. Control of the sea. Intercom, 1975, 78, 26-30. (History)

The article provides background information and a role playing activity which examines the conflict over control of the oceans.

703. Netboy, A. Tragic history of the blue. American Forests, 1975, 81, 42-44. (Whales)

*704. New Hampshire University. Marine program annual report 1973. 1977 (ERIC Document Reproduction Service No. ED 129 561). (Reports)

The report describes the activities of a program designed to develop the information and system necessary for managing the Continental Shelf and Coastal Zone of Northern New England.

705. Newman, B. Behind the glomar sub hunt. Nation, 1975, 221, 329-333. (Oceanography)

706. Newsweek. Return of the anchovy. Newsweek, 1976, 83, 74-75. (Fish)

707. Newsweek. Flashlight fish. Newsweek, 1975, 86, 113. (Fish)

708. Newsweek. 4-H frogmen; farming the oceans. Newsweek, 1974, 84, 107. (Careers)

709. Norris, J. P. Shrimp farming. Sea Frontiers, 1974, 20, 100-107. (Food)

710. Norten, V. J. The sea grant program and world food problems. Sea Grant Conference, 1968, 2, 25-28. (Food)

*711. Northern New Jersey Conservation Foundation. Education for survival: ecology in science and social studies curriculum guide for grade V. 1972 (ERIC Document Reproduction Service No. ED 066 359). (Curricula) (Grade 5)

In this program, grade five students evaluate their attitudes regarding man and interaction with the environment. It also presents oceanography units in outline form.

*712. Norton, B. Exciting fish story evolves on coast. The Open Door, 1970, 6 (1), 6-7. (Careers)

Marine technology students at Cape Fear Technological Institute investigate the habits of fish near Wrightsville Beach. Findings contribute to scientific knowlege of the local area.

*713. Nutting, W. B., Zottoli, R., & Gustafson, A. H. Tidepool transect. American Biology Teacher, 1971, 33 (5), 282-285. (Methods)

The authors discuss the teaching in tide pools which was accomplished by a Bodwin College NSF summer institute.

714. Obrien, J. J. & Hurbburt, H. E. Equatorial jet in the Indian Ocean: theory. Science, 1974, 184, 1075-1077. (Oceanography)

*715. Occupations. The deep-sea pilot. Occupations, 1938, 16 (6), 560-561. (History)

The author describes the job of a harbor pilot at the time of writing.

716. Ocean Industry. Training ocean technicians under NSF sea grants. Ocean Industry, 1969, 4 (7), 21. (History)

717. Oceans. Ocean resources; symposium. Oceans, 1976, 9, 10-43. (Careers)

718. Oceans. Waves; ocean waves; symposium. Oceans, 1975, 8, 10-49. (Waves)

*719. Odonnel, M. M. Oysters, pearls of nutrition. American Biology Teacher, 1941, 3 (3), 84-87. (Food) (High School)

The author presents some historical information concerning the use of oysters as food. He also discusses methods by which oysters feed, spawn, and how one can ascertain their ages.

*720. Office of the president. The federal ocean program. 1973 (ERIC Document Reproduction Service No. ED 072 962). (Reports)

The report reviews the nation's efforts to comprehend, conserve, and use the ocean. The report presents a comprehensive description of the activities and accomplishments of all agencies and departments of the federal government in the field of marine sciences during fiscal year 1971.

*721. Olgin, H. Fishes that crawl on land and climb trees. American Childhood, 1951, 36 (9), 62. (Fish) (Grades K-12)

This is a discussion of fish that climb trees and also includes information concerning the part of the world in which they live.

*722. Olympus Research Corporation. Marine education: guidelines for curriculum development. Final report. 1976 (ERIC Document Reproduction Service No. ED 119 981). (Curricula)

The report describes the status of marine career education in the United States as of July 1975. The group cites the areas of greatest need as: (1) the establishment of interagency coordination for the development of career education, and (2) the need for comprehensive marine occupational analysis.

*723. Olympus Research Corporation. Technical report. (Marine career cluster project). 1976 (ERIC Document Reproduction Service No. ED 119 980). (Curricula)

This report describes marine education research project procedures, time lines, and methodologies required in the conduct of a research project. Also described are 225 marine occupations which were identified as a result of the circulation of 22,000 questionnaires.

*724. Oort, A. H. The atmospheric circulation, the weather machine of the earth. The Science Teacher, 1971, 38 (9), 12-16. (Weather)

Oort discusses the earth's weather system and the role played by the ocean in the system.

*725. Operations Research Inc. Evaluation of NJROTC influence on navy accessions. 1973 (ERIC Document Reproduction Service No. ED 082 029). (Careers)

This study evaluated the membership in NJROTC and future enlistment in the navy. The study failed to find a positive relationship.

726. Opportunity. Alaska: king salmon builds eskimo power. Opportunity 1971, 1 (2), 4-9. (Fish)

727. Orange County Department of Education. Selected bibliography in marine sciences: books and periodicals. Santa Ana, California, Orange County Department of Education, 1977. (Bibliographies)

728. Orange County Department of Education. Compilation of data collected aboard the Orange County department of education's marine science floating laboratory, fury II. Santa Ana, California, Orange County Department of Education, 1977. (Methods)

*729. Orange County Department of Education. Marine science programs. Santa Ana, California, Orange County Department of Education, 1977. (Bibliographies)

This is a catalog of the programs offered by the marine science laboratories of the Orange County Department of Education.

*730. Orange County Department of Education. Teacher's guide, Orange County marine science floating lab. Santa Ana, California, Orange County Department of Education, 1977. (Curricula)

The document includes information for the preparation of a class for a floating lab field trip.

*731. Oregon State University. Reading in marine science, a partially annotated bibliography for young readers, nonprofessionals and teachers. 1968 (ERIC Document Reproduction Service No. ED 046 743). (Bibliographies)

The 300 entries in this bibliography are grouped as follows: general references, historical and exploration, biological oceanography, geological oceanography and physical oceanography.

*732. Osborn, G. Our water supply. School Science and Mathematics, 1967, 67 (589), 200-203. (Pollution)

This is a discussion of pollution control and desalting of sea water as a source of fresh water.

*733. Osgood, R. E. et al. Toward a national policy, 1976 and beyond. 1977 (ERIC Document Reproduction Service No. ED 134 418). (Reports) (High School)

Osgood's report includes the following chapters: (1) the evolving international ocean regime, (2) the third U. N. Conference on the law of the sea, (3) national security, (4) commercial navigation, (5) marine environment, (6) fisheries, (7) mineral resources, (8), marine science.

*734. Osner, R. F. A summer marine biology seminar for U. S. fifth air force high school students. American Biology Teacher, 1964, 26 (1), 40-42. (Curricula) (High School)

The author discusses the program in general as well as its field trips. Students are required to have a 3.0 school average before they can be admitted to the program.

*735. Panush, N. Anchored ship explores new fields. American Vocational Journal, 1970, 45 (4), 64-67. (Methods)

A ship serves as a classroom for disadvantaged youth training for careers as oceanographic aids.

736. Parker, H. S. Seaweed farming in the Sulu sea. Oceans, 1976, 9, 12-19. (Food)

*737. Parkhurst, J. L. Barnacles in fact and fiction. American Biology Teacher, 1960, 22 (7), 433-434. (Macroorganisms)

Parkhurst discusses many aspects of barnacles including the origin of their name, how their plates fit together, etc.

*738. Parkhurst, J. L. Corners of the shore. American Biology Teacher, 1958, 20 (4), 122-124. (Beaches)

This is a discussion of the beach at low tide after a storm, and a discussion of the strand line.

*739. Parkhurst, J. L. Nature notes. American Biology Teacher, 1957, 29 (1), 56-57. (Macroorganisms)

The author describes physically, sand dollars and razor clams.

*740. Parkhurst, J. L. Inexpensive exhibits for biology teachers. American Biology Teacher, 1956, 18 (5), 193-195. (Methods)

The author shows the reader a method of establishing the starfish in a museum setup.

*741. Passow, M. Literature as a scientific hors d'oeuvre. Journal of College Teaching, 1975, 4 (3), 189-190. (English)

Passow describes a course titled, "Literature of the Oceans" designed to stimulate student interest in science, and acquaint them with sources of information for future use.

742. Payne, R. At home with right whales. National Geographic, 1976, 149, 322-339. (Whales)

*743. Peck, D. G. H. A day of oceanography. Science and Children, 1971, 8 (6), 11-13. (Curricula)

This article contains descriptions of field oriented marine science activities.

744. Pennington, H. Restrained race for an ocean resource: manganese nodules. Oceans, 1976, 9, 36-43. (Oceanography)

745. Pepin, J. How to open oysters. House Beautiful, 1976, 118, 136. (Food)

746. Pequegnat, W. E. Whales, plankton and man. Scientific American, offprint No. 853, January 1958. (Macroorganisms) (High School)

747. Perkins, K. Southern California marine planktons. Santa Ana, California, Orange County Department of Education, 1977. (Microorganisms) (High School)

748. Perkins, K. Annotated bibliography in marine sciences. Santa Ana, California, Orange County Department of Education, 1977. (Bibliographies) (Grades 4-8)

*749. Perkins, K. Marine science activities packet. Santa Ana, California, Orange County Department of Education, 1977. (Methods) (Grades K-8)

The packet consists of an instructors manual, bingo game, board game, animal picture cards, word flash cards and marine animal playing cards.

*750. Pesson, L. L. Coastal fishermen of Louisiana: their characteristics, attitudes, practices, and responsiveness to change. 1973 (ERIC Document Reproduction No. ED 092 740). (Careers)

The major objective of this writing was to identify problems and opportunities for an organization with the capabili y of delivering effective extension education programs.

*751. Peter, W. G. New York bite: a case study part II. Bioscience, 1970, 20 (1), 669-671). (Pollution)

The author discusses legislation which has not been implemented to prevent pollution of the New York Bight.

*752. Peter, W. G. New York bight: a case study, part I. Bioscience, 1970, 20 (10), 617-619. (Pollution)

The author summarizes chemical analyses, pelegic studies, and benthic studies bearing on pollution in the New York Bight.

*753. Peyton, P. & Schreiber, S. (Eds). Proceedings: the sea grant association annual meeting (7th university of Washington, October 29-31, 1974). 1977 (ERIC Document Reproduction Service No. ED 134 411). (Reports) (High School)

The Sea Grang annaul meeting provides a forum through which information may be shared between the several sea grant colleges. It gives prospective students an idea of what they might expect if they decide to study in the marine sciences at one of these institutions.

*754. Phillips, M. G. The funny little stickleback. The Grade Teacher, 1959, 76 (8), 25. (Fish) (Grades K-8)

Some of the habits of the stickleback, including mating behavior, are discussed herein.

755. Phipps, J. Critters: killer whales. Sea World, 1977-1978, Winter, 14-16. (Whales) (High School)

*756. Picker, L. How about using scuba? Science Activities, 1975, 12 (5), 23-25. (Methods) (High School)

The author suggests that ecology clubs utilize skin or scuba diving techniques to do ecological research.

757. Picker, L. Marine art. University of Maine at Orono, Northern New England Marine Education Project, 1978. (Curricula) (Grades K-1)

*758. Pilkey, O. H. Let the lighthouse fall in. The High School Journal, 1974, 58 (6), 1-10. (Beaches) (High School)

Pilkey discusses the effects of the sea upon the beaches of the world, shoreline engineering, and suggests that man must learn to live with nature.

759. Pinchot, G. B. Ecological aquaculture. Bioscience, 1974, 24, 265. (Food)

760. Pipkin, B. W. et al. Laboratory exercises in oceanography. San Francisco, W. H. Freeman and Company, 1977. (Methods) (High School)

761. Pitluga, P. Teaching limnology--oceanography to inland students by utilizing the planetarium. Unpublished masters thesis, State University College, Oswego, 1971. (Methods)

*762. Pletcher, T. F. Plankton nets from plastic bottles. American Biology Teacher, 1968, 30, 186-188. (Equipment)

Plastic bottles and bolting cloth may be used to build plankton nets. The author also describes different types of tows which can be made with these nets.

763. Plumb, R. Chemical principles exemplified. Journal of Chemical Education, 1973, 50 (6), 425-426. (Chemistry) (High School)

764. Plumb, R. Chemical principles exemplified. Journal of Marine Chemistry, 1972, 49 (1), 28-30. (Chemistry) (High School)

*765. Pond, S. E. The marine biological laboratory. School Science and Mathematics, 1939, 665-669. (History)

The author describes a marine science laboratory which was conducted the year the article was published the article also provides some locations of laboratories in other countries.

766. Pomeroy, L. R. Ocean's food web, a changing paradigm. BioScience, 1974, 24, 499-504. (Oceanography)

767. Ponti, R. A. A unit on sand dunes as an introduction to earth science in junior high. Unpublished masters thesis, Rhode Island College, 1965. (Curricula) (Grades 9-12)

*768. Pope, P. H. Bringing marine animals to an island laboratory. American Biology Teacher, 1940, 2 (7), 175-178. (Methods)

Marine species are collected at the sea coast and transported back to an inland school. The author discusses the tools used in collection and the methods used in the transportation of the specimens.

*769. Pope, P. H. Maintaining a salt water aquaria. American Biology Teacher, 1949, 11 (3), 84-85. (Aquaria)

Pope discusses the experiences gained using an aquarium over the winter.

770. Porter, J. W. Community structure on coral reefs on opposite sides of the Isthmus of Panama. Science, 1974, 186, 543-545. (Oceanography)

*771. Porter, T. R. Earth-space science teaching tips from TST, a compilation of articles from seven years of the science teacher 1960-1966. 1967 (ERIC Document Reproduction Service No. ED 020 103). (Bibliographies)

This collection of articles contains many suggested activities and other information vital to the marine science teacher. The publication is available from NEA, Publications Sales Division, 1201 16th St., N. W., Washington, D. C. 20036.

*772. Postiglione, R. Dancing mothballs and fish buoyancy. American Biology Teacher, 1975, 37 (1), 49. (Fish) (High School)

Mothballs may be used in jars and tanks as a method of studying the ways in which and the facility with which fish can change depths.

773. Powell, G. C. Gregarious king crabs. Sea Frontiers, 1974, 20, 206-211. (Crabs)

*774. Powell, R. University of California sea grant program, Annual report 1974-1975, September 1, 1974 to August 31, 1975. 1977 (ERIC Document Reproduction Service No. ED 129 608). (Reports) (High School)

The document provides an overview of California's Sea Grant Program for the inclusive period. It gives prospective students an idea of the directions they might go if they decide to educate themselves for a marine career through the University of California.

*775. Practical Home Economics. Abundance from the sea. Practical Home Economics, 1955, 33 (7), 18-20. (Food)

This is a discussion of fish as food and what is available (as of the date of publication) to the consumer.

*776. Practical Home Economics. The sacred cod goes to school. Practical Home Economics, 1955, 33 (5), 21. (Food)

The author discusses the use of fish in school lunch programs in Massachusetts.

*777. Prescott, J. H. Making known the world water. The Journal of Marine Education, 1976, Summer, 6-7. (Methods) (Grades K-12)

Prescott describes the New England Aquarium, its location and some of its activities.

*778. Presidents Science Advisory Committee. Effective use of the sea report of the panel on oceanography of the president's science advisory committee. 1966 (ERIC Document Reproduction Service No. ED 046 720). (Reports)

The report concerns marine activities of the nation and how they contribute to the national well being.

779. Price, K. S., Shaw, W. N. & Kanberg, K. S. First international conference on aquaculture nutrition. Newark, Delaware, College of Marine Studies, Univeristy of Delaware, 1976. (Food) (High School)

*780. Project Coast. A partial list of curriculum materials exhibited at the national marine education association conference. Project Coast, Univeristy of Delaware, 3-6 August 1977. (Bibliographies)

The bibliography contains 92 entries. The citations include course descriptions, curriculum guides, bibliographies, collections of sea related diagrams, etc.

*781. Project Coast. An annotated bibliography of periodical sources for marine environment studies. Project Coast, University of Delaware, 1977. (Bibliographies)

The bibliography contains the names of journals, magazines, newsletters and bulletins. There are more than 180 periodicals listed herein.

*782. Project Coast. A list of books on the marine environment for children and for young people. Project Coast, University of Delaware, 1977. (Bibliographies)

Many of the entries in this 61 page bibliography are annotated. The listings cover not only the field of marine science but many others as well. This is truly a cross disciplinary approach to marine education.

*783. Project Coast. A catalog of curriculum materials for marine environment studies elementary-secondary. Project Coast, University of Delaware, 1977. (Bibliographies)

This 38 page bibliography is a catalog of curriculum materials for both elementary and secondary levels. The secondary section is divided into the following sections; biological oceanography, physical and chemical oceanography, geological oceanography and general oceanography. The majority of the entires are annotated.

*784. Project Coast. Audio-visual aids, games, and art for marine environment studies. Project Coast, University of Delaware, 1977. (Bibliographies)

The majority of this 89 page bibliography is annotated. It lists films, filmstrips, simulation games, and art prints and slides.

*785. Project Coast. Thermal pollution by nuclear power plants. A learning experience for coastal and oceanic awareness studies, No. 320. 1977 (ERIC Document Reproduction Service No. ED 141 165). (Pollution) (High School)

The publication contains several activities regarding the use of nuclear power plants and their possible effects upon the environment.

*786. Project Coast. Simulation game: superport. A learning experience for coastal and oceanic awareness studies, No. 311. 1977 (ERIC Document Reproduction Service No. ED 141 162). (Social Studies) (High School)

Superport is a learning experience which requires students to examine how a superport and its related industries will affect the marine environment of a given area.

*787. Project Coast. Salinity changes in a tidal river. A learning activity for coastal and oceanic awareness studies, No. 308. 1977 (ERIC Document Reproduction Service No. ED 141 161). (Chemistry) (High School)

The purpose of this minicourse is to provide information for organizing and conducting a marine field study in the area referred to by the course title.

*788. Project Coast. Measuring dissolved oxygen quantitatively collecting and cultivating marine bacteria. To recognize, record, and analyze characteristics of a beach environment. Quantitative and qualitative analysis of phosphate in water. Learning experiences for coastal and oceanic awareness studies, nos. 307, 309, 310, 313. 1977 (ERIC Document Reproduction Service No. ED 141 160). (Chemistry) (High School)

This document is actually a collection of four minicourses.

*789. Project Coast. The ocean: source of nutrition for the future. A learning experience for coastal and oceanic awareness studies, no. 305. 1977 (ERIC Document Reproduction Service No. ED 141 159). (Food) (High School)

This minicourse is divided into four major areas: (1) an overview, (2) marine plants, (3) fish protein concentrate, and (4) aquaculture.

*790. Project Coast. Pesticides and the marine environment. A learning experience for coastal and oceanic awareness studies, no. 237. 1977 (ERIC Document Reproduction Servide No. ED 141 158). (Pollution) (High School)

This document is designed to provide an intreduction to the effects of pesticides on marine organisms and the marine environment.

*791. Project Coast. Economic and political exploitations of marine resources. A learning experience for coastal and oceanic awareness studies, no. 235. 1977 (ERIC Document Reproduction Service No. ED 141 157). (Social Studies) (High School)

This minicourse emphasizes the exploitation of mineral, food, and animal resources of the sea.

*792. Project Coast. Sea floor spreading. A learning experience for coastal and oceanic awareness studies no. 302. 1977 (ERIC Document Reproduction Service No. ED 141 156). (Geology) (High School)

The minicourse is concerned with the geology of sea floor spreading.

*793. Project Coast. Marshes: nature's bounty. A learning experience for coastal and oceanic awareness studies, no. 230. 1977 (ERIC Document Reproduction Service No. ED 141 155). (Marshes) (High School)

This minicourse concerns itself with the importance of the marsh. The salt water marsh is considered from aesthetic, recreational, economic, food web, and man' impact points of view.

*794. Project Coast. A comparative study of clam and squid. Biting flies of the coastal region. Diatoms: nature's aquatic gems. Learning experiences for coastal and oceanic awareness, nos. 227, 231, 232. 1977 (ERIC Document Reproduction Service No. ED 141 154). (Oceanography) (High School)

This is a collection of three minicourses. The minicourses pursue study indicative of their titles.

*795. Project Coast. The rocky shore. A learning experience for coastal and oceanic awareness studies, no. 225. 1977 (ERIC Document Reproduction Service No. 141 153). (Oceanography) (High School)

This instructional unit emphasizes life in the coastal zones. It considers plant and animal life, as well as the factors influencing life in these zones.

*796. Project Coast. Observing starfish--the water vascular system. A learning experience for coastal and oceanic awareness studies, no. 224. 1977 (ERIC Document Reproduction Service No. ED 141 152). (Starfish) (High School)

The unit emphasizes the various aspects of the anatomy and behavior of the starfish.

*797. Project Coast. Air and life. A learning experience for coastal and oceanic awareness studies, no. 223. 1977 (ERIC Document Reproduction Service No. ED 141 151). (Chemistry) (High School)

Emphasis is placed upon the study of the composition of air and its relationship to life in aquatic and marine environments.

*798. Project Coast. Microfossils from the local marine environment. A learning experience for coastal and oceanic awareness studies, no. 219. 1977 (ERIC Document Reproduction Service No. ED 141 150). (Microorganisms) (Grades 9-12)

In this minicourse, students collect and process sediment samples, examining them for microfossils.

*799. Project Coast. What is physical oceanography? A learning experience for coastal and oceanic awareness studies, no. 217. 1977 (ERIC Document Reproduction Service No. ED 141 149). (Oceanography) (Grades 9-12)

This minicourse includes activities related to properties of sea water, physical phenomena of the ocean, and the physical features of the oceans.

*800. Project Coast. The moon, the sun, and tides. A learning experience for coastal and oceanic awareness studies, no. 214. 1977 (ERIC Document Reproduction Service No. ED 141 148). (Tides) (Grades 6-12)

This is an introduction to the variables that cause the tides.

*801. Project Coast. The "RA" expeditions: the archaeological and anthropological background. The "RA" expeditions: the coriolis effect. The "RA" expeditions: the papyrus reed. A learning experience for coastal and oceanic awareness studies, no. 211, 212, 213. 1977 (ERIC Document Reproduction Service No. ED 141 147). (Social Studies) (Grades 6-12)

These three minicourses provide experiences in the areas indicated by the course titles.

*802. Project Coast. Utilization of estuarian organisms by indians. A learning experience for coastal and oceanic awareness studies, No. 210. 1977 (ERIC Document Reproduction Service No. ED 141 146). (History) (Grades 6-8)

The thrust of this unit is the past use of marine organisms and the marine environment by the American Indians.

*803. Project Coast. Where have all the menhaden gone? A learning experience for coastal and oceanic awareness studies, no. 209. 1977 (ERIC Document Reproduction Service No. ED 141 145). (Fish) (High School)

This unit focuses on the conept that populations of marine organisms are unevenly distributed.

*804. Project Coast. Ships through the ages. A learning experience for coastal and oceanic awareness studies, no. 110. 1977 (ERIC Document Reproduction Service No. ED 141 144). (Social Studies) (Grades 3-6)

The unit emphasizes the story of ships and history associated with sea travel and transportation.

*805. Project Coast. The muskrat. The not-so-common oyster, The horseshoe crab. The blue crab. Learning experiences for coastal and oceanic awareness studies, nos. 108, 109, 111, 201. 1977 (ERIC Document Reproduction Service No. ED 141 143). (Macroorganisms) (Grades K-8)

These minicourses emphasize the organisms specified in their titles. Each unit contains teacher background materials, student activity materials, evaluation materials, transparency masters, and selected references.

*806. Project Coast. Ships and seaways. A learning experience for coastal and oceanic awareness studies, no. 105. 1977 (ERIC Document Reproduction Service No. ED 141 142). (Language Arts) (Grade 5)

The unit empahsizes language arts and social studies activities related to ships and seaways.

*807. Project Coast. Water for fun. A learning experience for coastal and oceanic awareness studies, no. 104. 1977 (ERIC Document Reproduction Service No. ED 141 141). (Recreation) (Grades K-4)

This teaching guide for students in grades K-4 provides suggestions for two class periods of instruction related to recreational use of water areas.

*808. Project Coast. Language arts activities to supplement COAST learning experiences. A learning experience for coastal and oceanic awareness studies, no. 5. 1977 (ERIC Document Reproduction Service No. ED 141 140). (Language Arts) (Grades 1-6)

Included in this teachers guide are activities emphasizing vocabulary development, the development of scrapbooks and other language arts related activities.

*809. Puerto Rico State Department of Agriculture. Training of fishermen for the tuna industry. 1969 (ERIC Document Reproduction Service No. ED 084 376). (History) (High School)

The author discusses the failure of a program to train Puerto Ricans to replace foreign crews on tuna boats. The article is of historical value as it relates to marine career education.

*810. Qutub, M. Environmental reference series, earth and environmental studies, part II. 1973 (ERIC Document Reproduction Service No. ED 072 970). (Bibliographies)

The book lists many books and articles, some of which are in the field of oceanography.

*811. Rabinowitz, A. et al. Oceanography: an environmental approach to marine science. 1970 (ERIC Document Reproduction Service No. ED 045 430). (Curricula)

This full year course emphasizes the interdisciplinary nature of the ocean. It provides field work, laboratory and classroom activities, vocabulary lists, bibliographies and subject matter outlines.

812. Rabinowitz, A. An environmental approach to marine science K-12. Journal of Environmental Education, 1970, 2 (1), 26-27. (Curricula) (Grades K-12)

813. Radinovsky, S. Shell game; adaptation of the hermit crab. Natural History, 1974, 83, 22-29. (Crabs) (Grades K-12)

*814. Raimist, R. J. Marine science sourcebook. First edition. 1970 (ERIC Reproduction Service No. ED 037 340). (Curricula) (Grades K-12)

This manual was prepared for a teacher's workshop in marine science by the Conservation and Environmental Science Center for Southern New Jersey at Brwon Mills. It includes when, where and how to collect marine mollusks, how to prepare a shell collection, taxonomic keys, recipes for solutions useful in relaxing, killing, and preserving marine organisms and an annotated bibliography.

*815. Raimist, R. J. A secondary school marine science curriculum. American Biology Teacher, 1968, 30, 189-192. (Curricula) (High School)

The author suggests the composition of a 10 unit marine science course. He also mentions the difficulty in finding precollege marine curricula.

*816. Raimist, R. J. Laboratory exercises in marine biology. 1967 (ERIC Document Reproduction Service No. ED 039 145). (Curricula) (High School)

This document was developed with the aid of Title III funds from ESEA. It contains directions for laboratory exercises using marine organisms. For each exercise, a problem is defined, materials are listed, and possible solutions are suggested. The exercises deal with the measurement of oxygen consumption in fishes, marine populstion densities, fertalization in the sea urchin, salinity tolerances of organisms, and food webs.

817. Raimist, R. J. Mounting of zooplankton, American Biology Teacher, 1967, 29 (6), 468-470. (Methods) (High School)

*818. Raimist, R. J. Laboratory exercises in marine biology for upper elementary and secondary school grades. Teachers edition. 1967 (ERIC Document Reproduction Services No. ED 039 123). (Curricula) (Grades 7-12)

These exercises contain information on marine aquaria, oxygen consumption, population density, salinity tolerance, food webs, etc.

*819. Raimist, R. J. An elective course at the secondary level. American Biology Teacher, 1966, 28 (1), 50-53. (Curricula) (High School)

Raimist discusses the justifications for a course of the type indicated in the title. He also discusses the goals of science education over a period of years and points to the need for discovery learning.

*820. Raimist, R. J. The oceans--an economic and geographic future for man. American Biology Teacher, 1966, 28 (1), 23-25. (Economics) (High School)

The author discusses economic and other reasons why the oceans are important to man's future.

*821. Rakestraw, N. W. Training in chemical oceanography. Journal of Chemical Education, 1958, 35 (3), 123-124. (Careers) (High School)

This is a discussion of the courses a future chemical oceanographer should study.

822. Rakestraw, N. W. Analytical chemistry in oceanography. Journal of Chemical Oceanography, 1958, 35 (3), 119-122. (Chemistry) (High School)

*823. Rakestraw, N. W. Hermann Wattenberg: a pioneer in a new field of exploration. Journal of Chemical Education, 1956, 33 (5), 217-222. (History) (High School)

The author discusses the life and accomplishments of one of the first marine chemists.

824. Ray, G. C. Rape of the oceans. Vogue, 1974, 164, 174. (Oceanography)

825. Read, K. R. H. Depths of the gulf of Maine. Oceans, 1974, 7, 8-19. (Oceanography)

*826. Reardon, M. Blubber, the baby seal. Instructor, 1958, 67 (7), 43. (Seals) (Grades K-6)

The first few days of the life of an Alaskan seal are described in this article.

*827. Reed, J. Operation lightship. Children Today, 1973, 2, 7-10. (Methods) (Grades K-12)

The article describes what actually happens as a class spends a day going to visit and returning from Lightship Chesapeake. The ship is a retired Coast Guard lightship run by the National Park Service in the Washington, D. C. area. The ship serves as a vehicle to introduce people to the ocean. The program materials are available from Operation Lightship, National Capital Parks, 1200 Ohio Drive, S. W., Washington, D. C. 20242.

828. Reeves, R. Right whale. Conservationist, 1975, 30, 32-33. (Whales)

829. Reid, A. Reporter at large; herring fishing off Mallaig. New Yorker, 1975, 51, 44-46. (Fish)

830. Reiger, G. Marine mammal muddles. Audubon, 1976, 78, 103-105. (Macroorganisms)

831. Reiger, G. How much is a seabird worth? International Wildlife, 1975, 5, 18-23. (Birds)

832. Reiger, G. Song of the seals. Audubon, 1975, 77, 6-27. (Seals)

833. Reiger, G. Green turtle farming: a growing debate; mariculture. Sea Frontiers, 1975, 21, 215-223. (Food)

834. Reiger, G. Good-by to the bluefin. Field and Stream, 1974, 78, 14. (Fish)

835. Reiger, G. First the whales, now the porpoises? National Wildlife, 1974, 12, 18-21. (Whales)

836. Reitze, A. W. & Reitze, G. L. Blood and seals in the Pribilofs. Environment, 1975, 17, 3-4. (Seals)

*837. Renwick, G. Algae mounts simplified. The Science Teacher, 1966, 33 (7), 65. (Methods) (High School)

Renwick discusses a method of mounting marine algae. The method makes use of file cards and transparent food wrapping.

838. Revelle, R. Weather, sea and ice studies in the IGY. The Science Teacher, 1957, 24 (6), 260-263. (History) (High School)

*839. Rhode Island State Department of Education. Marine activity dynamics (M.A.D.). Unit S. 1977 (ERIC Document Reproduction Service No. ED 137 063). (Curricula) (Grade 5)

This curriculum guide describes an activity oriented toward a marine studies program. The lesson topics include marine biology, fish adaptations, studies in unusual fish, commercial and soft-bone fish, marine geophysics, reptiles and mammals of the sea, waterfowl, conchology, algae, cephalapods, crustaceans, water pollution, and chemical ocean studies.

840. Rice, A. L. & Chapman, C. J. Scampi; the Norway lobster. Sea Frontier, 1974, 20, 258-268. (Lobsters) (High School)

*841. Richardson, N. Just add water. The Journal of Marine Education, 1976, Summer, 20-25. (Methods)

Nancy discusses a sailing, shipboard maintenance, and general nautical program involving girl scouts.

*842. Richeson, K. & Knaack, J. Interdisciplinary outdoor education, sea and shore. 1972 (ERIC Document Reproduction Service No. ED 061 034). (Curricula) (Grades K-3)

This is a teachers guide. It presents 24 classroom units, most of which involve observing and discussing the various kinds of life found at the seashore. The guide provides the teacher with the scientific background required to teach the activities.

*843. Riddle, J. Jacques Cousteau's living sea: a museum of the mind and the senses. Oceans, 1973, 6 (5), 34-35. (Methods) (Grades K-12)

The author describes the major exhibits that are found at the museum. The museum is located aboard the Queen Mary at Long Beach, California.

*844. Riddle, J. The living sea love of Jean-Michel Cousteau. Oceans, 1973, 6 (5), 38-39. (Methods) (Grades K-12)

This article considers the development of the museum discussed in the previous citation (Riddle).

*845. Rillo, T. J. Exploring oil pollution. Science Activities, 1974, 11 (2), 52-57. (Methods) (Grades K-12)

This article includes 22 oil pollution related activities.

*846. Ring, P. Marine related films available from the university of Maine film rental library. 1974 (ERIC Document Reproduction Service No. ED 095 023). (Bibliographies) (Grades K-12)

The document lists marine related films. Some of the citations are annotated.

847. Robin, G. de Q. The ice of the Antarctic. Scientific American, 1962, offprint No. 861. (Oceanography) (Grades 7-12)

848. Robinson, J. P. Superwaves of southeast Africa. Sea Frontier, 1976, 22, 106-116. (Waves)

849. Robinson, J. P. Newfoundland's disaster of 29; burin. Sea Frontier, 1976, 22, 44-51. (Tides)

*850. Rogers, W. A. & Nisos, M. J. An inventory of U. S. navy courses suitable for use in training civilian personnel in basic technical skills. 1977 (ERIC Document Reproduction Service No. ED 118 915). (Careers) (High School)

This is an inventory of courses of study developed by the U. S. Navy which might be useful to other private and public institutions. Some of the marine categories are: marine science, engineering; marine science, navigation; marine science, seamanship; oceanography.

851. Rosa, N. What price whales? Oceans, 1975, 8, 68-69. (Whales)

852. Ross, J. D. & Bergeron, J. Oceanography: a smorgasbord in marine studies for high school students. Sea World, 1977-78, Winter, 33-35. (Methods) (High School)

853. Rubin, M. J. The Antarctic and the weather. Scientific American, 1962, offprint No. 859. (Weather)

*854. Rudman, A. J. The role of geophysics in new global techtonics. The Science Teacher, 1969, 36 (7), 21-26. (Careers) (High School)

The author summarizes the developments which led to the concept of the new global plate techtonics. The new theory attempts to explain the existence of ocean ridges, trenches, and island arcs.

855. Ruggieri, G. D. & Rosenburg, N. D. Octopus: cowardly lion of the sea. Oceans, 1974, 7, 50-55. (Macroorganisms)

*856. Rutherford, R. San Francisco bay studies. American Biology Teacher, 1974, 36 (2), 110. (Methods) (Grades K-12)

The Marine Ecological Institute at Redwood City, California conducts ecological sea voyages on its research vessels for students of all educational levels. During the voyages, students get hands-in-the-water training in chemistry, ichtheology, and invertebrate biology. The instruction is provided by staff scientists.

857. Rutzler, K. Oil pollution damage observed in tropical communities along the Atlantic seaboard of Panama. BioScience, 1970, 20 (4), 222-224. (Pollution)

858. Ruud, J. T. The ice fish. Scientific American, 1965, 213 (5), 108-114. (Fish) (Grades 7-12)

859. Sadler, L. A. Coastal management: a challenging assignment. Sea World, 1977, Fall, 14-15. (Curricula)

*860. Sainsbury, J. C. A vocational technical institute development program for commercial fisheries. Final report. 1972 (ERIC Document Reproduction Service No. ED 068 087). (Careers) (High School)

The author describes the development of a 2 year program in commercial marine fisheries. The program was designed to reduce the traditional training period for fishermen.

861. Sale, P. F. Reef fish lottery. Natural History, 1976, 85, 60-65. (Fish)

*862. Sanbon, F. Tides of the British seas. Physics Education, 1975, 10 (4), 262-266. (Tides) (High School)

Gravitational effects upon tides, and the way that local conditions interract with these conditions to produce local tides is the main thrust of the article.

863. Sands, B. Mercury monitoring highlights Long Island swordfish tournament. Conservationist, 1971, 25 (2), 27-31. (Pollution)

*864. Sauro, R. The seal who did not like water. Grade Teacher, 1956, 73 (5), 14. (Seals) (Grades K-6)

The author describes the conditions under which seals live.

*865. Scarff, J. M. A tour of mudflat town. 1970 (ERIC Document Reproduction Service No. ED 055 834). (Reading) (Grade 2)

The publication was developed with the aid of Title III ESEA funds. The text is a supplementary second grade reading text. It includes information about waves, plants, animals, grasses, and algae.

*866. Schaefer, M. B. Bisheries productivity. School Science and Mathematics, 1969, 69 (607), 141-149. (Food) (High School)

The use of the ocean as a food source is the thrust of this article.

*867. Schell, M. E. Occupational orientation, secondary level. Part 2. Curriculum bulletin no. 73CBM2. 1973 (ERIC Document Reproduction Service No. ED 094 239). (Careers)

This is a document designed to be used by teachers in developing career education and career awareness programs. It contains five occupational clusters, one of which is in marine science.

868. Schellenger, K. Marine life of the Galapago's. Sea Frontier, 1974, 20, 322-332. (Oceanography)

*869. Schelske, C. L. The fate of fallout radioactivity in an estuary. American Biology Teacher, 1966, 28 (5), 373-380. (Methods) (High School)

Schelske discusses radioactive fallout and how it is measured in intertidal species.

*870. Schlenker, R. M. Methods used in studying intertidal stratification on piers and jetties of the coast of New England. Unpublished masters thesis, Univeristy of Maine at Gorham, 1969. (Methods) (High School)

This document contains information which is essentially descriptive. Many of the methods could be used in high school field oriented labs. Copies of the doucment are available upon request from the author.

*871. Schlenker, R. M. & Butzow, J. W. Marine science teacher education project. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 345, September 1976a. (Reports)

This was a grant proposal submitted to the University of Maine Office of Sea Grant in the spring of 1976.

*872. Schlenker, R. M. Marine chemistry: salinity for elementary school students. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 349, September 1976b. (Methods) (Grades K-8)

In this activity, students study and investigate salinity by evaporation of clear unknown solutions.

*873. Schlenker, R. M. Physical oceanography: investigations in sea water density. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 262, August 1976c. (Methods) (Grades K-8)

In this activity, students study sea water density by investigating the buoyancy of pine and oak blocks in fresh and saline water.

*374. Schlenker, R. M. Properties of sea water: a study by comparison--boiling point elevation. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 263, August 1976d. (Methods) (Grades 7-12)

Students are led to discover a difference between fresh and saline water by comparing boiling points between the two liquids.

*875. Schlenker, R. M. Physical oceanography by comparison: freezing point depression. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 266, August 1976e. (Methods) (Grades 7-12)

In this activity, students study fresh and saline water by comparing their freezing points.

*876. Schlenker, R. M. Investigations in marine chemistry: exploring salinity as a group activity. ERIC Information Analysis Center for Science, Mathematics and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 347, September 1976f. (Methods) (Grades 7-12)

In this activity, students are led to disciver that in every liter of sea water there are 1000 grams of salt. This is accomplished by having several different groups of students evaporate part of a one liter sample. The residue is then combined and weighed.

*877. Schlenker, R. M. Salinity measurements using a hydrometer. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 348, September 1976g. (Methods) (Grades 7-12)

An hydrometer is used in this activity to demonstrate a difference between saline and fresh water.

*878. Schlenker, R. M. Relocation of a point in the intertidal zone: an exercise in mapping. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 346, September 1976h. (Methods) (Grades 7-12)

This activity gives students experience with two different methods of relocating points within the intertidal zone.

*879. Schlenker, R. M. Measuring salinity with a test tube, pencil and cork. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 021 344, September 1976i. (Methods) (Grades K-12)

In this activity, students are led to discover a difference between saline and fresh water by evaluating the buoyancy of a pencil as it floats in two unknown solutions.

*880. Schlenker, R. M. Marine science: a discovery exercise with single celled and simple organisms. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, The Ohio State University, Columbus, Ohio, SE 021 350, September 1976j. (Methods) (High School)

Students participating in this activity look at water samples at a shore site prior to being introduced to these types of organisms in a lecture situation.

*881. Schlenker, R. M. Help! marine science education association needed. American Biology Teacher, 1976k, 38 (8), 494. (Reports)

In this article, the author appeals to the academic community to form a marine science education association.

*882. Schlenker, R. M. An introduction to the marine environment: a mini-unit. 1977a (ERIC Document Reproduction Service No. ED 128 163). (Careers)

This is a unit designed to introduce preservice science teachers to the marine environment. It includes an introduction to oil pollution.

*883. Schlenker, R. M. Investigations in marine chemistry: tide pool ecology. 1977b. (ERIC Document Reproduction Service No. ED 128 205). (Methods) (High School)

In this activity, students study the effects of time on tide pools at various heights in the intertidal zone.

*884. Schlenker, R. M. Investigations in marine chemistry: salinity I. 1977c (ERIC Document Reproduction Service No. ED 128 206). (Methods) (High School)

Students who take part in this activity build thier own salinometers. Information is included which describes a method of mixing salt solutions.

*885. Schlenker, R. M. Investigations in marine chemistry: salinity II. 1977d (ERIC Document Reproduction Service No. ED 128 207). (Methods) (High School)

In this activity, the student puts to work the salinometer built as a result of the activity listed in number 884 above.

*886. Schlenker, R. M. Marine science education materials and their usefulness. 1977e (ERIC Document Reproduction Service No. ED 128 208). (Bibliographies) (Grades K-12)

This document lists over 200 marine education documents. Their sources are included as well as in many cases, a grade level of applicability. Many of the documents included herein are available free of charge.

*887. Schlenker, R. M. Precollege marine science education 1973 through 1976. 1977f (ERIC Document Reproduction Service No. ED 129 581). (Reports) (Grades K-12)

This a state of the art paper for the inclusive years. It covers activity throughout the U. S.

*888. Schlenker, R. M. The commercial fisheries of Maine: a review and critique. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, The Ohio State University, Columbus, Ohio, SE 022 102, March 1977g. (Careers) (High School)

This is a critique of the publication, Commercial Fisheries of Maine.

*889. Schlenker, R. M. The national marine education association, its genesis and future. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, The Ohio State University, Columbus, Ohio, SE 022 160, March 1977h. (History)

This is a paper which was delivered at the State of New Hampshire Marine Education Conference, March 22, 1977 at the University of New Hampshire at Durham.

*890. Schlenker, R. M. Investigation of tidal cycles: an activity for students who live away from the sea shore. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, The Ohio State University, Columbus, Ohio, SE 022 251, April 1977i. (Methods) (Grades 7-12)

This activity makes use of newspapers and other documents in the study of tidal cycles. The activity can be conducted at almost no cost for a large number of students.

*891. Schlenker, R. M. A report to the University of Maine, office of sea grant concerning the 6th national marine education conference, Pacific Grove, California, October 26-29, 1976. 1977j (ERIC Document Reproduction Service No. ED 133 201). (Reports)

The report discusses the conference in general and includes the names of some of the nationally known participants.

*892. Schlenker, R. M. How long do marine organisms live? Investigations in the marine evinronment for children. 1977k (ERIC Document Reproduction Service No. ED 134 400) (Methods) (Grades 7-12)

Students who participate in this exercise study the life span of the soft shelled clam.

*893. Schlenker, R. M. Strand line observations for high school students: an exercise in the marine environment. 19771 (ERIC Document Reproduction Service No. ED 134 401). (Methods) (High School)

This activity takes students into a study of how to evaluate the contents of the strand line.

*894. Schlenker, R. M. An introduction to marine education, a course for preservice science teachers. 1977m (ERIC Document Reproduction Service No. ED 135 644). (Careers) (High School)

This is a secondary science methods course in which all the methodology revolves around the marine world.

*895. Schlenker, R. M. and Crowell, L. D. Marine science education in Maine. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 484, May 1977n. (Reports)

This article presents the results of a survey of the background of preservice science teachers at the University of Maine at Orono in the marine science area.

*896. Schlenker, R. M. & Butzow, J. W. Northern New England marine education project. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 636, April 1977o. (Reports)

This is a project which revises the Marine Education Project COAST materials for use in the northern New England area.

*897. Schlenker, R. M. & Butzow, J. W. The University of Maine at Orono, precollege marine science teacher education project. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 364, April 1977p. (Reports)

This was a project which sought to train inservice teachers in the marine science areas.

*898. Schlenker, R. M. 1973 Seminar in maritime and regional studies: a review and overview. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, The Ohio State University, Columbus, Ohio, SE 022 475, May 1977q. (History) (High School)

This is a critique of the seminar report.

*899. Schlenker, R. M. Marine science education in Maine 1976. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 271, April 1977r. A paper presented at the 1976 Maine State Science Teachers' Convention, Waterville High School, Waterville, Maine, October 1, 1976. (Reports)

This paper discusses the state of the art in marine science education in the State of Maine in 1976. The document lists the names and addresses of several individuals in the State of Maine who were teaching marine sciences in their classrooms in 1976.

*900. Schlenker, R. M. Marine weather: an inquiry activity for young marine science educators. ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 275, April 1977s. (Methods)

This activity allows the student to study marine weather in the classroom.

*901. Schlenker, R. M. A partial bibliography for pre college marine science educators. 1977t (ERIC Document Reproduction Service No. ED 137 130). (Bibliographies) (Grades K-12)

This is a partially annotated bibliography of marine education documents.

*902. Schlenker, L. L. & Schlenker, R. M. The readability of selected marine science texts by grade level. 1977u (ERIC Document Reproduction Service No. ED 137 108). (Methods)

The authors evaluate the readability of several marine science texts.

*903. Schlenker, R. M. At reserve group Southwest Harbor, marine training and education is everyone's business. The Coast Guard Reservist, 24 (8): 8-9, May-June 1977v. (Careers) (High School)

This article discusses a training program for inactive duty Coast Guard Reservists.

*904. Schlenker, R. M. The basics of inshore navigation for high school students. ERIC Information Analysis Center for Science, Mathematics and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 081, March 1977w. (Methods) (High School)

In this activity, students study piloting using charts, parallel rulers and the discovery approach to learning.

*905. Schlenker, R. M. State and regional marine education associations. ERIC Information Analysis Center for Science, Education, and Environmental Education, the Ohio State University, Columbus, Ohio, SE 022 726, August 1977x. (Reports)

This document lists several marine education associations in the U. S.

*906. Schlenker, R. M. Recent articles, activities, and other documents in the marine education field. 1978a (ERIC Document Reproduction Service No. ED 148 607). (Bibliographies) (Grades K-12)

The bibliography includes a listing of 36 recent marine education articles. The majority of these involve activities which are useful in classroom situations.

*907. Schlenker, R. M. An introduction to the fundamentals of chemistry for the marine engineer. 1978b (ERIC Document Reproduction Service No. ED 148 620). (Careers) (High School)

This document describes a chemistry course at Maine Maritime Academy that is required of all marine engineering students.

*908. School Science and Mathematics. Lack of legal status holds back sea miners. School Science and Mathematics, 1967, 67 (595), 722. (Law)

The article discusses the problems involved when one considers the possibility of mining the sea floor.

*909. School Science and Mathematics. Trained fish. School Science and Mathematics, 1949, 49 (426), 8. (Fish) (Grades 7-12)

Fish were trained to detect industrial pollution. The article describes this training.

*910. Schriner, K. L. A study of enlisted training and education in applied oceanography. 1972 (ERIC Document Reproduction Service No. ED 094 944). (Careers) (High School)

Current navy training programs in oceanography and their short comings are disucssed herein. New training courses and navy ratings are also suggested.

911. Schroeder, R. & Haughey, L. Distribution of salt marsh life. Sea World, 1977-78, Winter, 45-50. (Methods)

*912. Schubel, J. R. Aboard the ridgely warfield. The Science Teacher, 1969, 36 (3), 36-38. (Methods) (High School)

At the time of publication, Johns Hopkins University's training vessel was holding day long training sessions for earth science teachers.

913. Schuessler, R. Wave energy. Oceans, 1975 (8), 34-37. (Waves) (High School)

*914. Schuessler, R. The civilizing current. The Science Teacher, 1969, 36 (6), 49. (Currents) (Grades 7-12)

This article discusses the magnitude of the Gulf Stream.

*915. Schurman, D. Marine and fisheries training in PEI. Canadian Vocational Journal, 1974, 10 (1), 2-5. (Careers) (High School)

The facilities, curriculum, and other aspects of Prince Edward Island's Marine and Fisheries Training Center in Summerville are the subjects of this article.

*916. Schuyler, S. User's guide for NODC's data processing systems. 1969 (ERIC Document Reproduction Service No. ED 067 135). (Methods) (High School)

The system was designed to aid users of the National Oceanographic Data Center to make better use of oceanographic information.

917. Schweitzer, J. P. Marine education in Louisiana. Aquanotes, 1978, 7 (1), 3-4. (Careers) (High School)

918. Schweitzer, J. P. Evolution of the sextant. LSU Marine Science Teaching Aid, 1975a, 7. (History) (High School)

919. Schweitzer, J. P. Circulation in estuaries. LSU Marine Science Teaching Aid, 1975b, 6. (Currents) (High School)

920. Schweitzer, J. P. Meiobenthonic fauna. LSU Marine Science Teaching Aid, 1974a, 4. (Oceanography) (High School)

921. Schweitzer, J. P. Determining latent heat. LSU Marine Science Teaching Aid, 1974b, 4. (Chemistry) (Grades 7-12)

*922. Schweitzer, J. P. A bibliography of popular books on the marine environment and wetlands ecology. 1973a (ERIC Document Reproduction Service No. ED 067 230). (Bibliographies) (Grades K-12)

This annotated bibliography contains 100 entries. The entries span the applicability range from K-12.

*923. Schweitzer, J. P. Directory of marine science education. 1973b (ERIC Document Reproduction Service No. ED 093 615). (Methods) (Grades K-12)

The directory provides a national listing of precollege marine science teachers.

*924. Schweitzer, J. P. Marine science education in America: its status in precollege programs. The Science Teacher, 1973c, 40 (8), 24-26. (History)

Marine sceince appeared in the schools about 15 years prior to the publication date. It appeared spontaneously in southern New England, Florida, and California. Many of the original programs were fostered by National Science Foundations sponsored summer institutes.

925. Schweitzer, J. P. As the world turns: the coriolis effect. LSU Marine Science Teaching Aid, 1973d, 3. (Currents) (High School)

926. Schweitzer, J. P. Measurement of currents. LSU Marine Science Teaching Aid, 1972, 1. (Currents) (High School)

*927. Science. Physical oceanography: big science new technology. Science, 1974, 185 (4147), 246. (Careers)

The article describes dynamic mid-ocean equipment and how it demonstrated that coordinated research programs could be conducted.

*928. Science Research Associates. Jobs in marine science. Job family series. 1977 (ERIC Document Reproduction Service No. 123 494). (Careers) (High School)

The descriptions of marine related careers include a shore research station and the activities of a marine biologist, a typical research expedition and some functions of marine geologista and chemists, marine engineering, divers, mining the sea, and fisheries and aquaculture.

929. Scientific American. The ocean. San Francisco, W. H. Freeman and Company, 1969. (Text) (High School)

930. Science Digest. What's in a whale spout? Work of G. L. Kooyman and others. Science Digest, 1976, 79, 16-17. (Whales)

931. Science News. Woods Hole embarks on supercruise. Science News, 1975, 108, 295. (Careers)

932. Science News. On the track of Pacific whales. Science News, 1974, 105, 39. (Whales)

933. Science News. Antarctic water's broad and icy reach. Science News, 1974, 105, 399. (Oceanography)

934. Science News. Antarctic voyage of discovery. Science News, 1974, 105, 317. (Oceanography)

*935. Science Teacher. Sea grant curriculum on the marine environment. The Science Teacher, 1975, 42 (2), 50-51. (Curricula)

The marine environment curriculum study was sponsored by sea grant. It was designed to relate specific problems of the marine environment to general fields of knowledge and study. At the time the article was written, the curriculum package had been sent to 35 schools for field testing.

936. Scott, J. D. Gull as a gullet. National Wildlife, 1974, 12, 34-37. (Birds)

937. Sea Frontiers. How sea snakes may avoid the bends. Sea Frontiers, 1975, 21, 358. (Oceanography) (High School)

938. Sea Frontiers. Mount Desert oceanarium. Sea Frontiers, 1975, 241-243. (Methods) (Grades K-12)

*939. Sea World Inc. Sea world curriculum guide. Program theme: behavior 4-8. 1977 (ERIC Document Reproduction Service No. ED 141 086). (Curricula)

The theme of this curriculum guide is behavior. It includes transparencies, and information sheets on bottlenose dolphins, the walrus, harbor seals, innate behavior, learned behavior, and trained behavior.

*940. Sea World Inc. Sea world curriculum guide. Program theme behavior K-3. 1977 (ERIC Document Reproduction Service No. ED 141 085). (Curricula)

The theme of this curriculum guide is behavior. It was designed for use prior to having a class make a visit to the Sea World Aquarium. However, the materials are useful without having students make the trip. The materials include transparencies and information sheets on whales.

*941. Sea World Inc. Sea world curriculum guide. Program: apations 4-8. 1977 (ERIC Document Reproduction Service No. 141 084). (Curricula)

This curriculum guide includes transparencies and information sheets on sharks and their adaption for survival.

*942. Sea World Inc. Sea world curriculum guide. Program theme: adaptions K-3. 1977 (ERIC Document Reproduction Service No. 141 083). (Curricula)

The theme of the unit is adaption. It includes transparencies and information sheets on tide pools, sea otters, marine mammals fishes, and invertebrates.

943. Sefton, M. Now they're farming turtles. Oceans, 1974, 7, 34-35. (Food)

*944. Seligmann, P. & Steinberg, M. Simple hydrodynamic treatment of ocean tides. American Journal of Physics, 1975, 43 (2), 1106-1108. (Tides) (High School)

The author presents a non-mathematical, hydrodynamic explanation of tide action suitable for introductory college science courses.

*945. Seltzer, R. J. Ocean pollutants pose potential danger to man. Chemical and Engineering News, 1975, 53 (8), 19-20. (Pollution)

A study was made by the national academy of sciences that points to certain pollutants in the ocean as being potential problems to humans and marine life.

946. Senior Scholastic. Ocean's riches are the finders keepers? Senior Scholastic, 1974, 104, 14-15. (Oceanography)

*947. Serina Press. Guide to films (16 mm) about ecology, adaption, and pollution. 1971 (ERIC Document Reproduction Services No. ED 055 960). (Bibliographies)

The document is available from Serina Press, 70 Kennedy St., Alexandria, Virginia 22305.

*948. Shalowitz, A. L. Our changing coastline. The Journal of Geography, 1940, 39 (1), 1-10. (Geography) (High School)

The author discusses the changing coastline, disappearing inlets, new inlets, etc.

949. Shaw, E. The schooling of fishes. Scientific American, 1962, Offprint No. 162. (Fish)

*950. Sherman, K. Coastal zooplankton. American Biology Teacher, 1967, 29 (6), 460-464. (Microorganisms) (High School)

In this article, food webs, plankton tows, plankton counts, and charts are discussed.

*951. Sherman, K. Zooplankton, a rich fauna for high school research. American Biology Teacher, 1962, 24 (7), 489-495. (Methods) (High School)

A project to determine seasonal abundance of various zooplankton constituents is outlined here. The author provides expected results, an equipment list, laboratory methods, collecting methods, and a bibliography.

*952. Sherman, K. A high school oceanography laboratory. American Biology Teacher, 1961, 23 (1), 29-35. (Methods) (High School)

The laboratory discussed herein is at Randolf, Mass High School. The article includes a list of laboratory equipment, projects conducted, a bibliography and much more useful information.

953. Shepard, F. P. et al. Internal waves advancing along submarine canyons. Science, 183, 195-198. (Oceanography)

*954. Shettler, J. Handbook of techniques, and guides for the study of the San Francisco bay-delta-estuary complex part 3, Key to invertebrates. 1971 (ERIC Document Reproduction Services No. ED 086 484). (Methods) (High School)

This is a key to identification of common invertebrate forms of the bay area. It includes physical descriptions and illustrations.

*955. Shipek, C. J. Microrelief on the sea floor. The Science Teacher, 1961, 28, 6-13. (Geography) (High School)

Shipek discusses sea floor relief, some history of its study, and how it varies with water content, depth, benthic animals, currents, types of bottom materials, etc.

*956. Sikora, R. Handbook of techniques and guides for the study of the San Francisco bay-delta-estuary complex part 6. Key to common fishes of San Francisco Bay. 1973 (ERIC Document Reproduction Service No. ED 086 487). (Methods) (High School)

This is a guide to identification of common fishes of the bay area. It includes physical descriptions and illustrations.

*957. Silverstein, H. & Siegel, L. 45 minutes from broadway, an action approach to marine biology. American Biology Teacher, 1975, 37 (7), 422-425. (Methods) (High School)

This program was conducted at John Dewey High School in Brooklyn, New York. Students study marsh lands, a barrier beach, water transport, density, evaporation and mathematical techniques used by scientists.

958. Simon, C. A citizen's guide to sources for marine and coastal information in Massachusetts. Massachusetts Institute of Technology Sea Grant Program, Cambridge, Mass. (M173G 77-13). 1977. (Methods)

*959. Sindermann, C. J. Blood types in fish. American Biology Teacher, 1967, 29 (6), 439-441. (Fish) (High School)

The author discusses a method of blood typing fish.

960. Sisson, R. F. Adrift on a raft of sargassum. National Geographic, 1976, 149, 188-189. (Oceanography)

*961. Skliar, N. Marine biology in the elementary school. American Biology Teacher, 1967, 29 (3), 226-228. (Curricula) (Grades K-8)

The author describes in detail a program run in Great Neck, N.Y.

*962. Sloan, M. D. Alfred was hungry. American Childhood, 1947, 33 (1), 52-53. (Macroorganisms) (Grades K-6)

This is a story that says much to young people. It considers the salt in the sea, a hungry octopus, sponges, seaweed, etc.

*963. Small, L. F. Teaching and research in biological oceanography. American Biology Teacher, 1966, 28 (1), 19-22. (Careers) (High School)

This article is probably better classified as history. It discusses marine programs of 1966, where they were, how large they were, etc.

964. Smith, A. W. Prospects for a law of the sea. National Parks and Conservation Magazine, 1976, 50, 2. (Law)

965. Smith, C. H. Towering tides of Fundy. National Wildlife, 1974, 12, 42-45. (Tides)

966. Smith, F. G. W. Planet ocean. Sea World, 1977, Fall, 5-6. (Methods)

967. Smith, F. G. W. Power from the oceans. Sea Frontiers, 1974, 20, 87-99. (Power)

968. Smith, F. J. The fisherman's business. Camden, Maine, International Marine Publishers, 1975. (Careers)

969. Smith, G. W. Destructive wind waves. Sea Frontiers, 1973, 19, 292-302. (Waves) (High School)

970. Smith, M. A bird? A bullet? No, it 's supergull; Charlie, herring gull of Key Biscayne. Smithsonian, 1976, 6, 98-100. (Birds)

971. Smithback, C. O. Vertical distribution of fauna on ledges and boulders in the intertidal zone at Point Mugu rock, southern California. Unpublished masters thesis, Mancato State College, 1966. (Methods) (High School)

*972. Smithsonian Institution. The smithsonian oceanographic sorting center. The Science Teacher, 1969, 36 (3), 29-31. (Careers)

The article describes the center's mission as well as the types of people who work there.

*973. Smithsonian Institution. Marine research fiscal year 1968, a catalog of unclassified marine research activities sponsored during FY 1968 by federal and non-federal organizations. 1968 (ERIC Document Reproduction Service No. ED 038 314). (Careers)

The document lists 2589 projects. They are categorized by subject. Many education projects are listed here.

974. Sobey, E. J. C. Antarctic winter oceanography: Ross Island and ice shelf. Sea Frontiers, 1975, 21, 283-290. (Oceanography)

*975. Soderberg, J. & Tomson, G. A. A summer course in oceanography for eighth grade students. American Biology Teacher, 1969, 31 (3), 151-154. (Methods) (Grade 8)

A summer course was conducted in the Falmouth, Mass. school system. The students studied plankton, fish distribution, potential productivity, did a clam survey, etc.

976. Soper, T. Beachcombing. New York, Taplinger Publishing Co., 1973. (Beaches) (Grades K-12)

977. Spangler, D. A. The development of a laboratory oriented oceanography unit for the high school. Unpublished masters thesis, Fisk University, 1968. (Curricula) (Grades 7-10)

*978. Spanger, J. U. Science school--a community summer school program for children. The Science Teacher, 1972, 39 (4), 39-40. (Methods) (Grades 9-12)

The author describes a summer school program run in Woods Hole, Mass. The program uses the facilities of the Oceanographic Institute at Woods Hole.

*979. Sprintzer, A. D. Trade union sponsored occupational training in the U. S. Maritime industry: the upgrading and retraining program of the national maritime union final report. 1971 (ERIC Document Reproduction Service No. ED 056 277). (Careers)

The author describes the author's increased interest in formal training after 1960.

980. Stacey, P. The imaginary sea. Sea World, 1977-78, Winter, 6-10. (Art)

*981. Stallo, C. J. A career in oceanography. The Science Teacher, 1971, 38 (7), 52-54. (Careers)

Stallo discusses an oceanographic career, sources of financial aid for such an education, lists of institutions in the oceanographic field. In addition, he lists publications which discuss oceanic education.

982. Starbird, E. A. Behold the baffling barnacle. Readers Digest, 1974, 104, 123-126. (Barnacles)

983. Stegner, R. W. A plan for environmental education. Sea World, 1977, Fall, 36-37. (Curricula)

*984. Stegner, R. Marine aquaria. American Biology Teacher, 1963, 25 (2), 128-129. (Aquaria)

The author describes methods of collecting specimens for, and using marine aquaria

*985. Stephan, E. C. Discolored water. The Science Teacher, 1962, 29, 6-11. (Microorganisms)

Plankton distribution, blooms, and toxicity to man and marine life are all discussed here.

986. Stephan, C. R. The needs of industry--scientists and technicians. Educating and training tomorrows oceanographers. Washington, Conference of the American Management Association, 1969. (Careers)

987. Stephan, C. R. Undergraduate education in ocean engineering and science. Educating and training tomorrow's oceanographers. Washington, Conference of the American Management Association, 1969. (Careers)

988. Stephan, C. R. Oceanography course at Oakview junior high school. Chicago, Northeastern Illinois State College, 1969. (Methods)

*989. Stephan, C. R. The oceans promise and challenge. The Science Teacher, 1965, 32 (4), 9-11. (Careers)

The author suggests that the greatest weakness in our national ocean program is our inability to educate marine scientists. In 1965, 45 universities had undergraduate programs in marine science.

990. Sticker, R. A maritime child looks around. Sea World, 1977, Fall, 47-48. (Methods)

*991. Stickney, A. Physiology of marine organisms and adaption to their environment. American Biology Teacher, 1967, 29 (6), 445-447. (Oceanography)

The author discusses the effects of salinity upon marine organisms.

992. Stickney, R. R. & White, D. B. Flounder: a potential aquaculture crop. Sea Frontiers, 1973, 19, 270-276. (Food)

993. Stommel, H. Future prospects for physical oceanography. Science, 1970, 168 (3939), 1531-1537. (Careers)

994. Stoever, E. C. & Yasso, W. E. Plate tectonics research and secondary school earth science. Sea World, 1977-78, Winter, 36-37. (Geology) (High School)

995. Stone, R. B. Artificial reefs. Sea Frontiers, 1974, 20, 25-33. (Oceanography)

*996. Stopyra, T. J. Sea pasture. American Biology Teacher, 1966, 28 (1), 31-38. (Food)

Stopyra points to the sea as a source of food for an expanding population. He discusses the types of marine organisms that can be used for food.

*997. Stout, P. K. & Callaghan, S. S. Marine career series: marine-related occupations, a primer for high school students. Marine memorandum number 41. 1977 (ERIC document Reproduction Service No. ED 138 450). (Careers) (High School)

This booklet contains a list of a wide range of job titles related to marine careers. It includes the sources of marine career education in 28 states. The requirements for each career field are also included.

998. Stout, P. K. Magazines related to the marine environment. The Journal of Marine Education, 1976, Fall, 2-42-2-44. (Methods)

*999. Stubenvoll, C. B. Starfish. Instructor, 1959, 68, 48. (Starfish) (Grades K-8)

The life of the starfish is discussed in this easy to understand article.

1000. Stuckey, W. Report from scripps: new secrets of the deep. Science Digest, 1975, 78, 70-76. (Oceanography)

1001. Sturges, W. & Blana, J. P. Western boundary current in the Gulf of Mexico. Science, 1976, 192, 367-369. (Currents)

*1002. Subarsky, Z. Seminar on marine biology. American Biology Teacher, 1966, 28 (1), 39-42. (Reports)

This is a discussion of a seminar held in Mombasa, Kenya.

1003. Sunset. Cruising to the sea lions; Monterey Harbor. Sunset, 1975, 155, 41. (Seals)

1004. Sunset. Winter clamming when tides are right. Sunset, 1974, 153, 31. (Food)

1005. Sutton, C. C. The wetlands: the heritage of our salt marshes. Unpublished masters thesis, Glassboro State College, 1972. (History)

1006. Sutton, T. B. Oceanography. Newport Beach, California, Newport Mesa Unified School District, 1968. (Curricula)

1007. Svatek, M. K. A study guide in oceanography for the Concord public schools. Unpublished masters thesis, 1968. (Curricula)

1008. Swann, M. Power from the sea. Environment, 1976, 18, 25-31. (Power)

1009. Sweig, R. M. A new breed of man: the aquanaut. The Journal of Marine Education, 1976, Fall, 2-39-2-42. (Careers) (Grades 7-12)

1010. Symonds, R. Marine awareness: education for the future. Sea World, 1977-78, Winter, 38-41. (Methods)

*1011. Systems Development Corporation. National data program for the marine environment final report. Volume one. 1969 (ERIC Document Reproduction Service No. ED 039 885). (Reports)

The document presents information concerning marine data management.

*1012. Systems Development Corporation. National data program for the marine environment, technical development plan, final report, volume two. 1969 (ERIC Document Reproduction Service No. ED 039 886). (Reports)

The report recommends a national data management program for the marine environment.

*1013. Taber, R. W. et al. An oceanography curriculum for high schools. 1968 (ERIC Document Reproduction Service No. ED 033 853). (Curricula) (High School)

The document contains the outlines for 18 one hour lectures on oceanography. Each outline lists the topics to be covered, supplemental texts, and realted films. The topics include oceanographic surveying and research, geology of the oceans, tides and currents, chemistry of sea water, marine biology, food from the sea, air-sea interaction, sea ice, estuaries, man and the sea, the continental shelf, limnology, underwater sound.

1014. Tanner, Z. L. On the appliances for collecting pelagic organisms, with special reference to those employed by the United States fish commission. Bulletin U. S. Commission on Fish and Fisheries, 1894, 14, 143-151. (History)

1015. Tarp, F. John Steinbeck: some reflections. Sea World, 1977-78, Winter, 23-26. (Literature)

*1016. Taylor, B. The field approach to coastal ecology, fall unit. 1970 (ERIC Document Reproduction Service No. ED 061 061). (Curricula) (Grade 10)

The program was developed by Carteret County Public Schools, North Carolina with the aid of title III funds of ESEA. In the program, coastal environments are used to demonstrate the basic principles of ecology. The author emphasizes the salt marsh. The program covers the factors limiting survival, distribution, chemical cycles, photosynthesis, respiration, and food cycles.

1017. Taylor, T. M. Shellfish mariculture; marine culture laboratory in California. Oceans, 1976, 9, 20-23. (Careers)

1018. Technical Education Reporter. Preparing for careers at sea. Technical Education Reporter, 1974, 1 (3), 78-82. (Careers)

*1019. Teel, W. et al. The need to establish a marine sciences technology program at Shoreline Community College. 1966 (ERIC Document Reproduction Service No. ED 011 781). (Curricula)

The authors discuss the results of a study designed to ascertain the need for such a school. They discuss the need for marine technology programs and the programs already in existence.

1020. Telander, R. Providing local color; collecting fish for salt water aquaiums; work of J. E. Turner. Sports Illustrated, 1976, 44, 30-35. (Aquaria)

1021. Tennesen, M. Good times. National Wildlife, 1976, 14, 42-47. (Oceanography)

1022. Tepley, L. Manna from the sea. Oceans, 1976, 9, 67. (Algae)

1023. Thomas, G. Russian naval terms from middle low German. Savonic and East European Review, 1971, 49 (115), 173-188. (Bibliographies)

1024. Thomas, R. F. Regular sea urchins of south Florida. Sea Frontiers, 1974, 20, 352-358. (Macroorganisms)

1025. Thompson, J. F. Oceanographic training courses for earth science teachers. Journal of Geological Education, 1969, 17 (3), 99-101. (Methods)

1026. Thompsom, T. G. A short history of oceanography with emphasis on the role played by chemistry. Journal of Chemical Education, 1958, 35 (3), 108-112. (History)

1027. Thorson, G. Life in the sea. Toronto, McGraw-Hill Book Company, 1976. (Text)

1028. Thresher, R. Place to live; territorial behavior of marine organisms. Sea Frontiers, 1975, 21, 258-267. (Oceanography)

1029. Thresher, R. E. Small predators on the reef. Sea Frontiers, 1974, 20, 219-227. (Fish)

*1030. Tignor, D. M. The collection of vertical migrating planktonic animals. American Biology Teacher, 1962, 24 (3), 208-209. (Methods)

In this project, students sampled plankton from different times of the day.

*1031. Tiller, R. E. Polished professional aides for coastal waters. Junior College Journal, 1972, 42 (8), 18-19. (Careers)

The estuarine research aide program at Charles County Community College, Maryland emphasizes the practical development of skills through field work.

1032. Time. Now, the cod peace; Icelandic British agreement. Time, 1976, 107, 37. (Social Studies)

1033. Time. Down in the valley; project famous. Time, 1974, 104, 61-62. (History)

1034. Time. Squeezing more out of the sea. Time, 1974, 104, 54-58. (Oceanography)

1035. Time. Farmous project; French-American mid-ocean undersea study. Time, 1974, 103, 77. (Oceanography)

1036. Times Magazine. The coast guard's women at sea. The Times Magazine, 1978, 6-10. (Careers)

1037. Toles, G. E. Tracking and monitoring whales. Sea Frontiers, 1974, 20, 294-297. (Whales)

*1038. Tolonen, P. Feasibility of establishment of associate degree program in marine technology at Clapsop Community College. 1965 (ERIC Document Reproduction Service No. ED 014 527). (Careers)

Tolonen discusses the ground work which was laid in the program development phase and the first year program.

1039. Toomey, K. E. Oceanariums. Retirement Living, 1974, 14, 28-30. (Social Studies)

1040. Torpey, W. G. Manpower needs for marine science. Ocean Industry, 1968, 3 (12), 14-15. (Careers)

*1041. Torpey, W. G. Educational principles in seamanship training. Nations Schools, 1946, 38, 20-22. (History)

The article discusses methods used to train merchant seamen for WW2. They learned by doing which was subject to frequent recall.

1042. Townsend, C. H. Description of a closing tow-net for submarine use at all depths. Report U. S. Commission Fish and Fisheries, 1894, 279-282. (History)

1043. Trigom. Directory of marine research facilities and personnel in Maine. South Portland, Maine, The Research Institute of the Gulf of Maine, 1974. (Bibliographies)

1044. Truver, S. C. The United States and the Strait of Gilbraltar. Marine Policy Reports, 1977, 1 (3). (Social Studies)

1045. Tyler, A. A simple, non-injurious method for inducing repeated spawning of sea urchins and sand dollars. Collecting Net, 1949, 19, 19-20. (Methods)

1046. Tyler, W. K. A study of the use of algae as a food source for humans. Unpublished masters thesis, Virginia State College, 1969. (Food)

1047. Tyrell, M. G. & Stegner, R. W. A conceptual scheme of studies of the aquatic environment. Sea World, 1977, Fall, 38-39. (Curricula)

*1048. UNESCO. Intergovernmental oceanographic commission seventh session. Summary report. 1972 (ERIC Document Reproduction Service No. ED 085 210). (Reports)

The report discusses marine pollution, education, legal proglems, and data management. Further, it makes proposals for international cooperation in these areas.

*1049. USCG. Training program for cooperative student trainees in professional career options; GS-trainee-2 to trainee GS-7. 1971 (ERIC Document Reproduction Service No. ED 051 489). (Careers)

This document describes a financial aid program for students at 61 universities. The program is offered through work study to students enrolled in degree programs in certain designated fields.

1050. U. S. Naval Oceanographic Office. Ocean science study kit, teachers kit. Clearfield, Utah, U. S. Naval Oceanographic Office, 1976. (Oceanography)

*1051. U. S. Office of Education. Seafood merchandising, a guide for training programs. 1964 (ERIC Document Reproduction Service No. ED 013 303). (Careers)

The document describes programs that are available.

1052. University and the Sea. Sea grant honors young scientists. The University and the Sea, 1976, 9 (3), 6. (Careers)

*1053. Van Dusen, B. Gift of the sea. The Grade Teacher, 1954, 71 (10), 18. (Sea Horses) (Grades K-8)

The author discusses how sea horses carry their eggs until they hatch, and how the young are carried after that.

*1054. Von Engeln, O. D. Wangeroog. The Journal of Geography, 1933, 32 (5), 220-222. (Geography)

On January 16, 1362, a marine flood separated three large German islands into 29 smaller islands.

*1055. Vaiuso, F. The sea, an interdisciplinary approach to marine science for elementary school children. 1970 (ERIC Document Reproduction Service No. ED 045 375). (Curricula) (Grades K-8)

The program was developed with the aid of Title III funds of ESEA by Newport-Mesa Unified United School District, Space Science Learning Program, 1601 16th Street, Newport Beach, California 92660. The lessons consider food chains, political issues, water and air pollution, physical characteristics of the oceans, etc.

1056. Valenti, R. J. The salt water aquarium manual. New York, Aquarium Stock Company, 1974. (Aquaria)

1057. Valentine, D. W. Family key to the fish commonly taken on board the Orange County schools floating marine science laboratory. Orange County Department of Education, Santa Ana, Ca. 92711, 1971. (Fish)

*1058. Valentine, D. W. Family key to the fish commonly taken on board the Orange County schools marine science floating laboratory. 1969 (ERIC Document Reproduction Service No. ED 051 988). (Fish)

The key was designed by junior and senior high school students. The diagrams and drawings show diagnostic characteristics.

1059. Valentine, V. W. & Moores, E. M. Plate techtonics and the history of life in the oceans. Scientific American, 1974, 230, 80-89. (History)

1060. Valentry, D. Sea cows that would not breed. Sea Frontiers, 1973, 19, 290-291. (Macroorganisms)

*1061. Vance, E. A seashore project inshore. American Biology Teacher, 1953, 15 (6), 145-148. (Methods) (Grade 3)

Vance describes a third grade marine science project which tied in all of the academic areas.

1062. Vessels, D. Education sails with the tides. Sea World, 1977-78, Winter, 51-54. (Methods)

*1063. Vetter, R. C. Oceanography information sources. 1970 (ERIC Document Reproduction Services No. ED 055 797). (Bibliographies)

The document lists information sources, oceanography kits, lab programs, newsletters, periodicals, bibliographies, career information sources, industries involved in oceanography, etc.

1064. Vietmeyer, N. Endangered but useful manatee. Smithsonian, 1974, 5, 60-65. (Macroorganisms)

1065. Vincent, J. E. A unit of natural history on the marine invertebrates of the Pacific northwest. Unpublished masters thesis, University of Utah, 1969. (Curricula)

*1066. Visick, H. H. Manpower for marine sciences. Higher Education, 1962, 18 (7), 7-10. (Careers)

The author discusses the great need for ocean scientists, and the problems in finding them.

1067. Voss, G. L. Octopus on the dining table. Sea Frontiers, 1974, 20, 236-243. (Food)

*1068. Wallace, B. Commentary: radioactive wastes and damage to marine communities. BioScience, 1974, 24 (3), 164-167. (Pollution)

The article discusses the effects of radioactive wastes on marine communities with reference to the fitness of populations.

1069. Waller, R. Voices across the deep. The Journal of Marine Education, 1976, Fall, 2-45-2-47. (Methods)

1070. Ward, R. R. Life-giving oils in the strait of Georgia; excerpt from into the ocean world. Natural History, 1974, 83, 52-61. (Oceanography)

1071. Warner, W. W. Winter drudging lifts crabs from Chesapeake swimmers. Smithsonian, 1976, 6, 82-86. (Food)

*1072. Warsh, K. L. Demonstrations in physics from oceanography and meterology. Physics Teacher, 1969, 7 (6), 327-329. (Methods)

The author suggests several useful demonstrations which can be done in the classroom.

1073. Waterbury, D. R. The little horse in the sea. Grade Teacher, 1960, 77 (8), 68. (Sea Horses) (Grades K-6)

This is a plain language description of the life of a seahorse.

*1074. Waterman, L. W. Officer education and training in oceanography for ASW and other naval applications. 1972 (ERIC Document Reproduction Service No. ED 094 935). (Careers)

The author discusses the types of oceanography needed in graduate programs for ASW officers.

1075. Waters J. F. Exploring New England shores. A beachcombers handbook. Lexington, Ma., Stone Wall Press, 1974. (Text)

1076. Waters, B. S. Resource tools in marine education. Sea World, 1977, Fall, 40-45. (Methods)

1077. Watkins, T. H. Day the birds wept; 1971 San Francisco Bay oil slicks. Audubon, 1976, 78, 16-21. (Pollution)

1078. Watkins, T. H. Longest hour; excerpt from on the shore of the sundown sea. Oceans, 1974, 7, 44-47. (Oceanography)

*1079. Watling, C. & Hallard, R. E. The sea beside us. Teaching the Exceptional Child, 1974, 7 (1), 26-28. (Methods)

The objectives of this program were: to provide an out of doors and overnight experience for mentally retarded, learning disabled orthopedically handicapped, hearing impared and visually impared students; to introduce these students to the non-commercial environmental aspects of Delaware beaches, bays and marshes.

*1080. Watrous, J. Animals of the arctic. The Grade Teacher, 1946, 63 (5), 40-41. (Whales) (Grades K-9)

Watrous discusses some student centered activities concerned with whales.

1081. Weaver, C. R. Proceedings of the conference on the changing identity of greaduate earth science education. 1965 (ERIC Document Reproduction Service No. ED 014 627). (Careers)

*1082. Webb, H. S. All wet-Palm Beach county's marine science program. Contemporary Education, 1973, 44, 346-348. (Curricula) (High School)

In 9 of 10 Palm Beach County high schools in 1973 offered some combination of marine science, marine biology, and oceanography. At the date of publication, over 1,000 students in this county were studying some sort of marine science. The county uses Jupiter Inlet Marine Science Center for part of the marine instruction.

*1083. Webster, S. Commencement on a coral reef. Oceans, 1973, 6 (5), 40-43. (Methods)

Sixteen students and three biology teachers from Northfield, Ma. spent two weeks of an environmental education program examining the ecology of a Caribbean reef.

*1084. Welch, W. R. Sedentary bottom animals. American Biology Teacher, 1967, 29 (6), 465-467. (Methods)

The author discusses methods of teaching students how filter feeders feed and how much they eat.

1085. Wells, M. M. The coral reefs of the Gulf Coast. School Science and Mathematics, 1930, 30, 124-131. (Oceanography)

1086. Welsh, J. H. Marine aquaria. School Science and Mathematics, 1937, 37, 899-901. (Aquaria)

1087. Wenk, E. Assessing impacts of new ocean law. Woods Hole, Ma., Woods Hole Oceanographic Institution (WHOI-76-104), 1976. (Social Studies)

1088. Wenk, E. Coastal waters and the nation. Civil Engineering, 1969, 39 (6), 52-55. (Oceanography)

*1089. Whitaker, D. M. Marine field study on the high school level. American Biology Teacher, 1975, 37 (4), 240-241. (Curricula) (High School)

This is a field based program which focuses on Narragansett Bay, and whose development was funded by Title III of ESEA. It carries a biology prerequisite and requires a three hour time block each week.

*1090. Whitehorn, N. C. Marine resources capabilities in Texas. Directory of personnel in government agencies. 1973 (ERIC Docuemnt Reproduction Service No. ED 072 959). (Careers)

This is a list of 105 individuals from 11 state and 12 federal agencies in Texas who were identified as possessing expertise in marine related activities.

*1091. Whitney, L. J. Osmoregulatory behavior in shore crabs. The Science Teacher, 1969, 36 (6), 58-59. (Crabs)

This is a description of an experiment in which students studied crabs' choices of salinities.

*1092. Whitney, P. C. Some elementary facts about the tides. The Journal of Geography, 1935, 34 (3), 102-108. (Tides)

The discussion of the tides includes types of tides and tide generating forces.

1093. Whittow, G. C. Sun, sand, and sea lions. Natural History, 1974, 83. 56-63. (Seals)

1094. Whittow, G. C. How hot is a whale? Sea Frontier, 1974, 20, 228-232. (Whales)

*1095. Wilhm, J. L. Simulation of sampling populations of benthic macroinvertebrates. American Biology Teacher, 1967, 29 (6), 471-474. (Methods)

The author describes the use of a statistical tool.

1096. Williams, H. Natural history guide to the vicinity of the marine studies institute at Dana Point. Orange County Department of Education, Santa Ana, Ca. 92711, 1977. (Oceanography)

*1097. Williams, H. R. Keys to common genera of marine plants taken aboard the orange county floating marine laboratory. 1970 (ERIC Document Reproduction Service No. ED 051 989). (Methods)

The key was designed by junior high and high school students with the aid of Title III funds of ESEA. It includes drawings and diagrams.

*1098. Williams, I. The traveling seaweed. American Childhood, 1953, 39 (1), 55. (Crabs) (Grades K-8)

Williams discusses the spider crab and how he covers himself with seaweed which reflects the area in which he is feeding.

*1099. Williams, I. A barnacle really settles down. American Childhood, 1951, 36 (7), 60. (Barnacles)

Every aspect of barnacle life is discussed in this article (how they feed, swim, settle, population densities, etc.)

*1100. Williams, J. A. & Venezian, G. Ocean engineering at the University of Hawaii. Engineering Education, 1969, 60 (3), 242-244. (Careers)

A program is described which leads to an M. S. degree in ocean engineering. It was established in 1969, and at that time was one of three in the U. S.

1101. Williamson, G. R. Riddle of the rorquals. Sea Frontiers, 1974, 20, 152-157. (Whales)

1102. Wilmerding, J. American imagery and visions of the sea. Sea World, 1977, Fall, 27-28. (History)

*1103. Wilson, A. L. The secrets of ocean life were revealed when we submerged! Instructor, 1961, 70 (5), 39. (Oceanography) (Grade 5).

In this 5th grade unit, students study sea shells, rocks, plant life, fishes, and the marine industry.

*1104. Wilson, D. A. Personnel implications of new technological developments: undersea technologies. 1969 (ERIC Document Reproduction Service No. ED 054 313). (Careers)

Personnel needs are projected for the next 20 years in the light of new underwater experimental techniques.

1105. Wilson, J. Killers in the surf; attack on sea lion colonies by killer whales; photographs. Audubon, 1975, 77, 2-5. (Macroorganisms)

*1106. Wilson, R. D. et al. Natural marine oil seepage. Science, 1974, 184 (4139), 857-865. (Pollution)

Environmental pollution problems caused by direct discharge of submarine seeps of marine oil are discussed herein.

*1107. Wise, C. D. Dear student: are you interested in oceanography? American Biology Teacher, 1959, 21 (8), 346. (Careers)

The author lists schools of oceanography, describes what a marine scientist does, who hires marine scientists, etc.

*1108. Wood, J. H. & Bayly, M. M. Field trip studies on Cape Hatteras. The Science Teacher, 1975, 42 (4), 23-25. (Methods) (High School)

York County, Va high school students took a three day field trip to Cape Hatteras to study marine ecology.

*1109. Wood, W. Orientation to the oceans. American Education, 1972, 8 (5), 17-22. (Careers)

This is a description of a marine science technician program at Cape Fear Technical Institute, Willmington, North Carolina. The document also contains information concerning original funding, sources of equipment, etc. The program relies on hands-on experience.

*1110. Woods, J. Down to the seashore. American Biology Teacher, 1953, 15 (1), 8-11. (Methods) (Grades 4-12)

The article provides excellent descriptions of how to make, prepare, and supply a marine aquarium, make shell collections, mount algae, and collect and preserve plankton.

*1111. Woolever, J. T. Marine laboratory for high school biology. The Science Teacher, 1963, 30, 12-13. (Methods) (High School)

The author discusses a marine lab in Sarasota, Florida which was started by a school biology club and developed into a full year marine science course.

*1112. Woollard, G. P. The coming role of oceanography in the nations economy. Ocean Test Range & Instrumentation Conference Proceedings, 1968, 13-33. (Careers)

*1113. World Future Society. Films on the future: a selective listing. 1973 (ERIC Document Reproduction Service No. ED 074 009). (Bibliographies)

Some marine films are included in this bibliography. Included with each citation is the film number, year of release, rental source, length, and a brief description.

*1114. Wright, B. L. Exciting pools. Physics Teacher, 1975, 13 (5), 275-278. (Methods)

The author advocates that mechanical oscillations be studies by studying swimming pool oscillations.

*1115. Wright, K. E. Preserving radulae patterns of limpets. American Biology Teacher, 1975, 37 (5), 300. (Aquaria)

The feeding patterns of limpets may be studied by studying their patterns of travel on the sides of marine aquaria.

*1116. Wright, R. W. Fertilization and embryology of sand dollars. American Biology Teacher, 1969, 31 (3), 184-185. (Sand Dollars) (Grades 7-12)

The author describes the collection and maintenance of sand dollars. He also describes methods of obtaining gametes.

*1117. Wyndham, L. Antarctic visitors. Instructor, 1950, 59 (8), 29. (Birds) (Grades K-6)

This article is a descriptive story of the penguins' life.

1118. Wyrtki, K. et al. Predicting and observing el nino. Science, 1976, 191, 343-346. (Currents)

1119. Yasso, W. Marine studies and art. Sea World, 1977-78, Winter, 55-56. (Art)

*1120. Yeater, L. W. A field experience--a why, a how. 1967 (ERIC Document Reproduction Service No. ED 020 830). (Methods)

This program was developed by Carteret County, North Carolina. It offers teachers a direct means of providing a directed discovery field oriented approach to the study of oceanography.

*1121. Young, G. Dry land and desalted water. Todays Education, 1970, 59 (5), 28-30. (Careers)

The author discusses the uses of desalted sea water. The costs of such processes are considered as well as the transormations which have taken place in areas where this source of water has been used.